TECHNOLOGY DEPT.

Gas Journal

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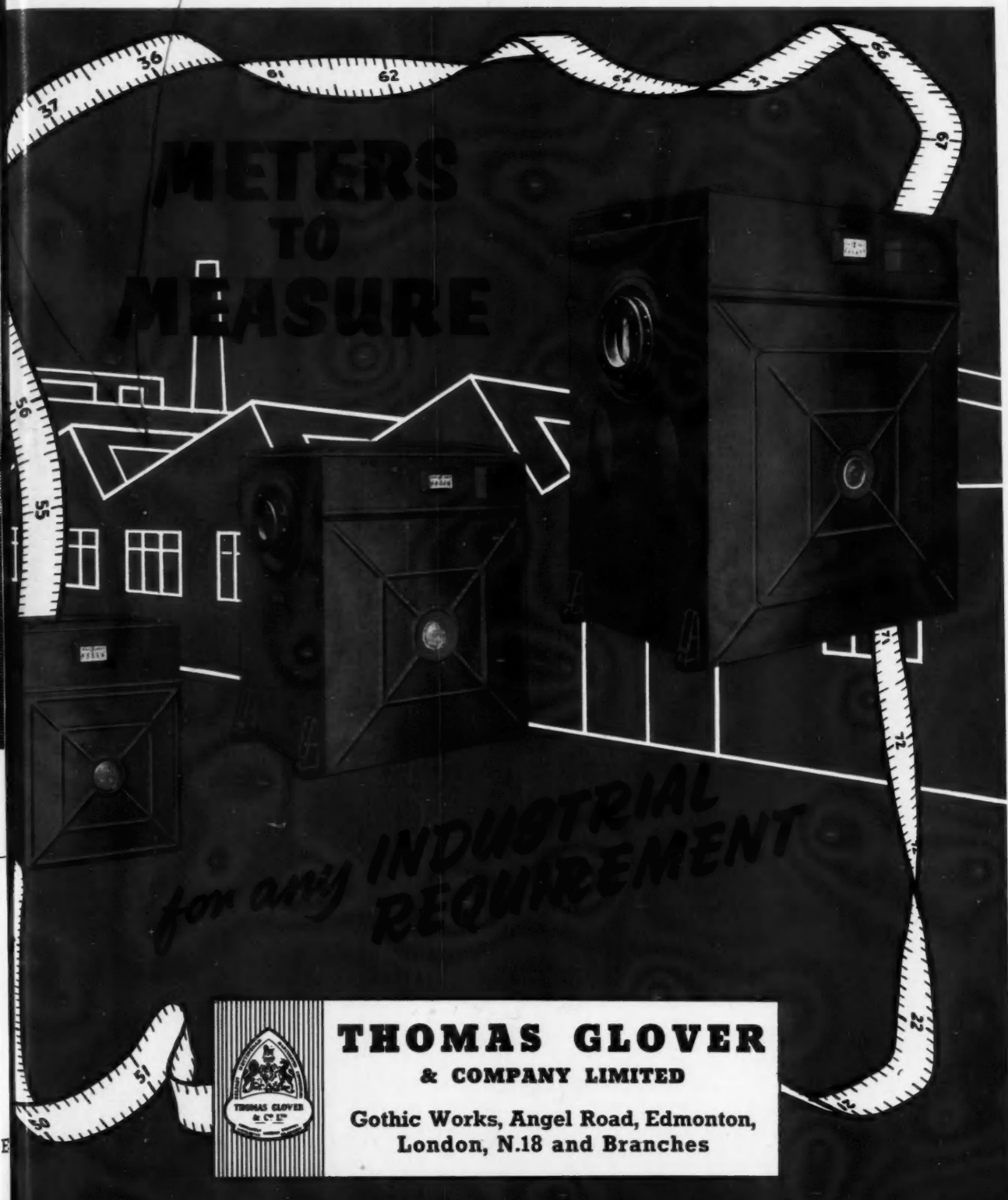

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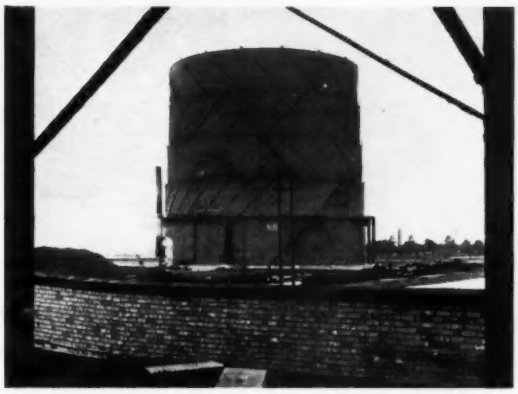

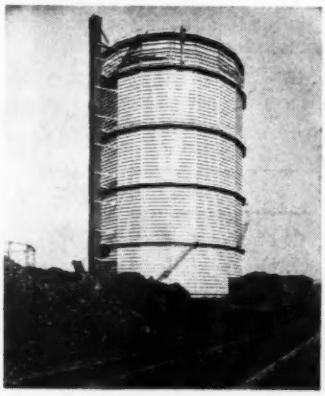

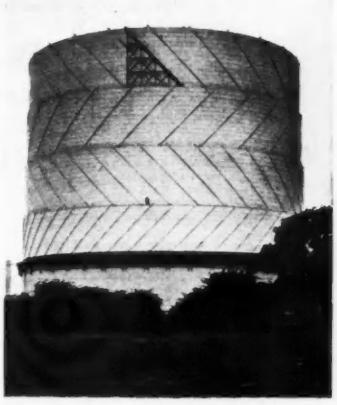

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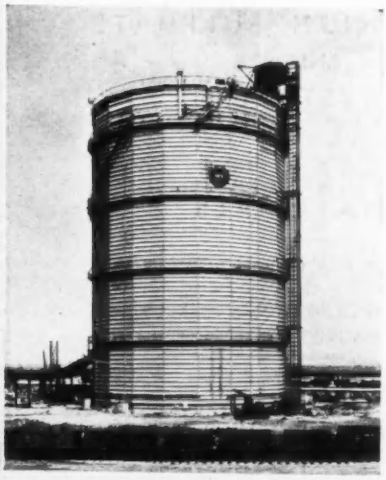

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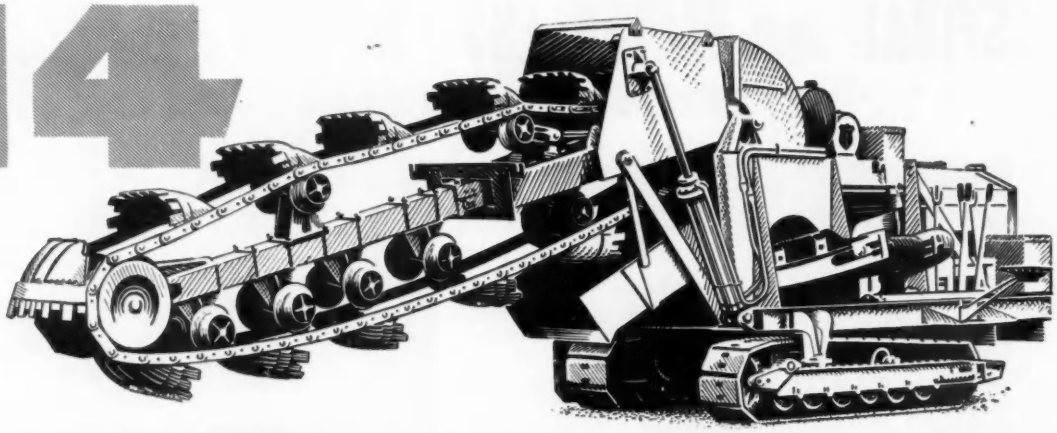

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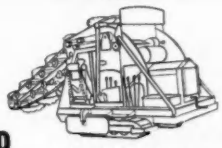

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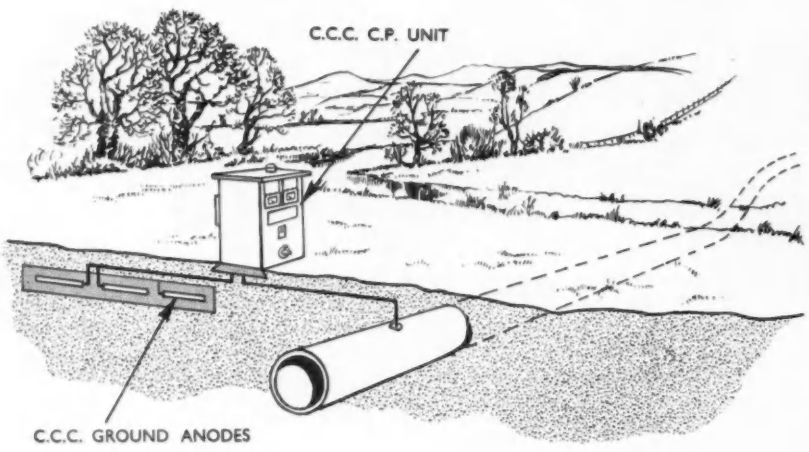

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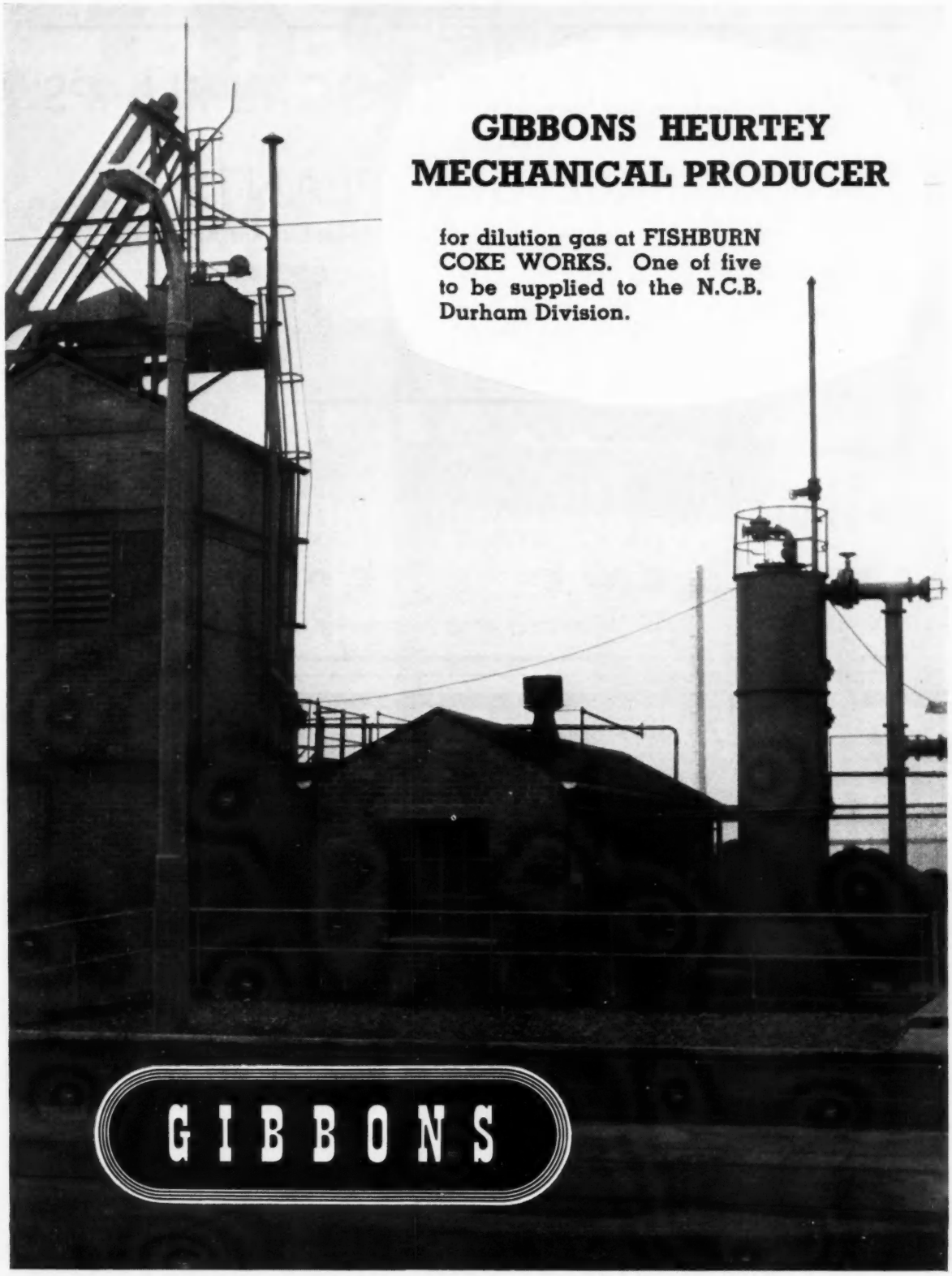
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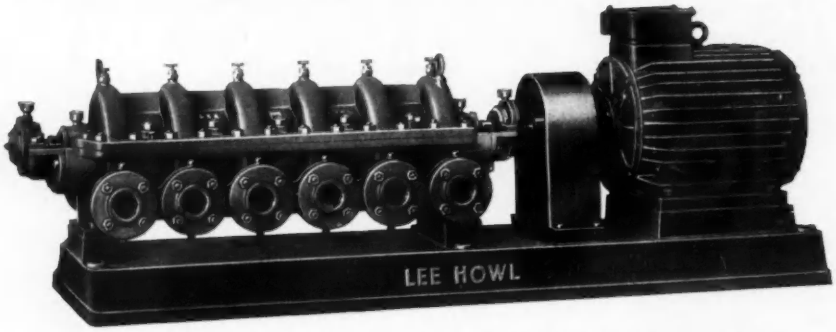

PHOTOGRAPH SHOWS A 2" SIZE SIX CELL PUMP WITH CIRCULAR FLANGES

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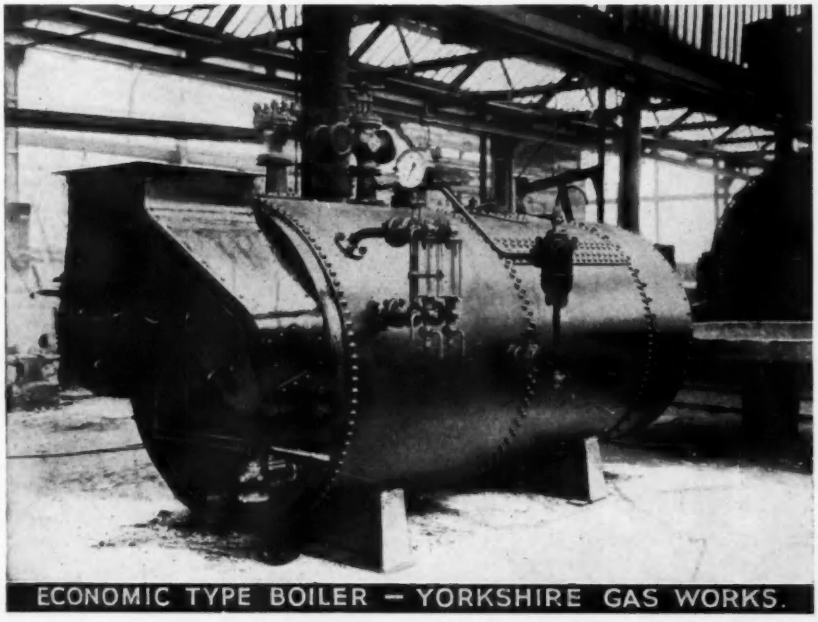

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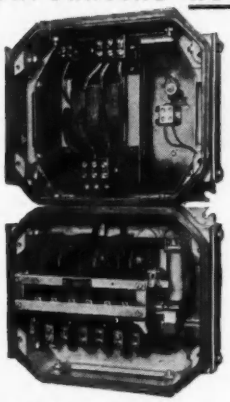
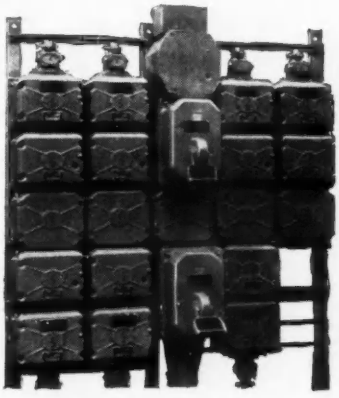
INCORPORATING AUTOMATIC CIRCUIT BREAKERS IN EACH OUTGOING WAY



A triple pole 30 amp. Circuit Breaker with core balance transformer and E.L. relay.

A typical multi-way board. Individual panel isolators also available.



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UNIQUE for application to portable and transportable equipment, for industrial use, mines and quarries, cement works, and marshalling yard installations.

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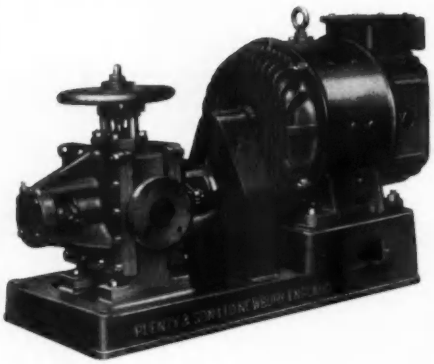

Illustration of a 3,000 gallons per hour pump unit, driven by a gas-works type motor

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One slot takes either coin.

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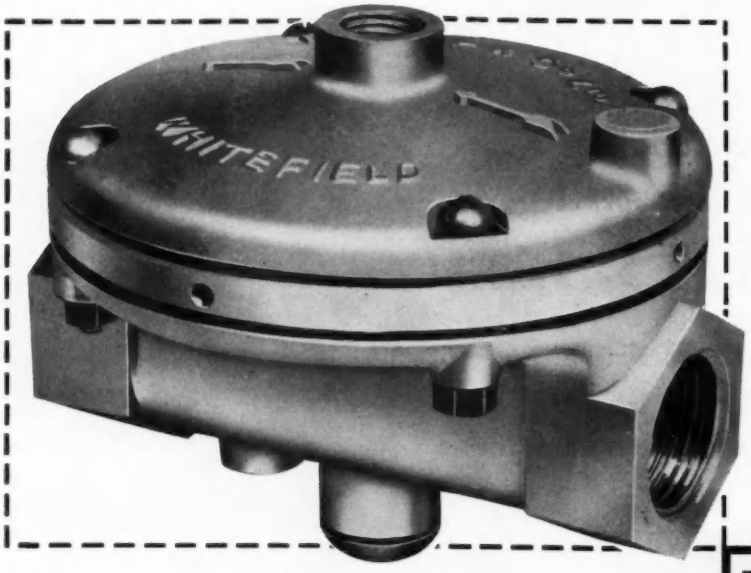

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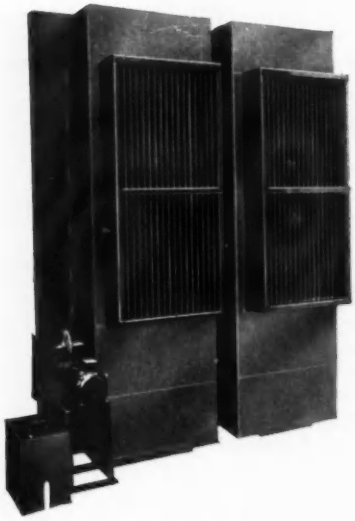

Clean air side of "Reciprojet" Air Filter illustrated on right. Photo shows geared motor with cover removed.

Two sections of a Patented Automatic "Reciprojet" Air Filter forming part of a 12-section filter of 80,000 c.f.m. capacity supplied to a steel works. View of dirty air side showing part of reciprocating mechanism.

British Patent No. 737,982

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for very dusty places

Where the air is heavily laden with dust—gas work —steelworks, collieries—our Patented "Reciprojet" Self-Cleaning type is best. This is installed in some of the largest industrial plants in this country. No matter how adverse the conditions, how dust laden the air, this filter maintains its high efficiency irrespective of the time it is in operation for, as its name indicates, it cleans itself while working. Other distinctive features are: two-stage filtration, time switch control, regular cleaning of each cell without removal of cells, effectual draining of oil cells, prevention of oil carry-over.

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MONOLITHIC PIPE LININGS

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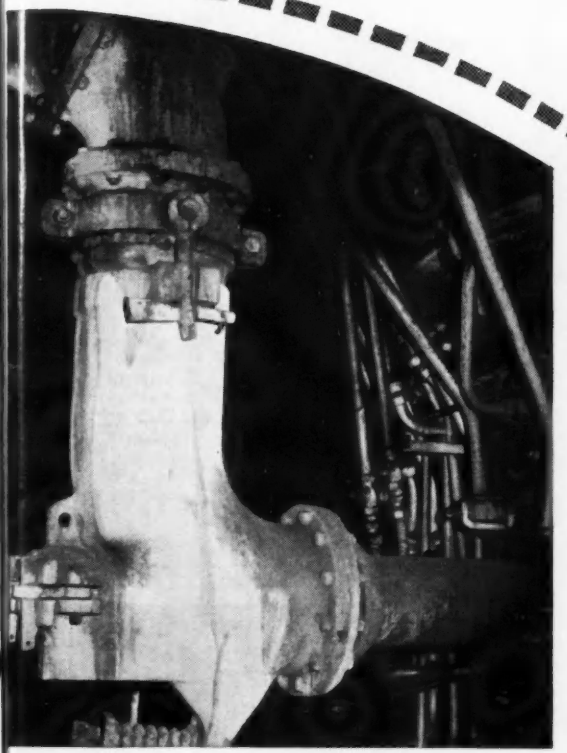
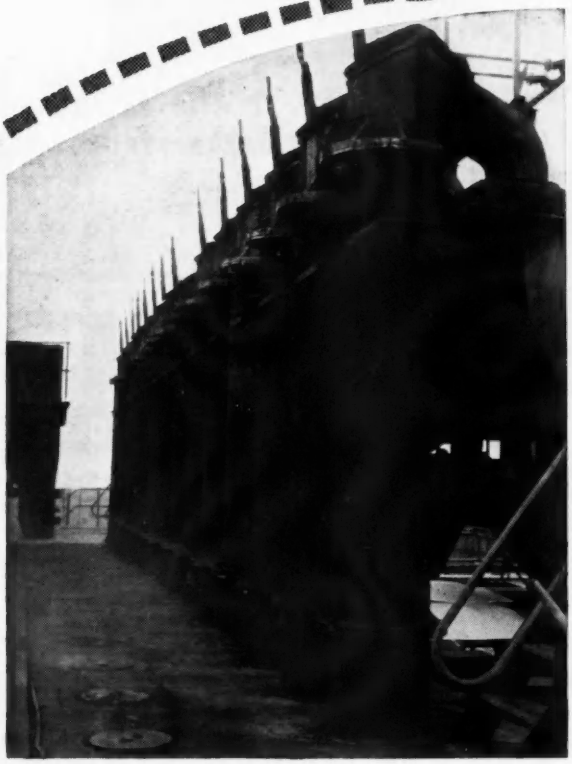


Refractory Concrete-lined Goose necks in position on blast furnace from bustle pipe to tuyere



A battery of refractory-concrete-lined ascension pipes in service.

Not only because of its great economy and ease of placing, but, being completely non-spalling and highly resistant to scour, it forms a really lasting non-collapsible rigid lining for foul mains, ascension pipes, bustle pipes and similar hard duty applications.

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Coke oven ascension pipes showing Refractory Concrete lining.

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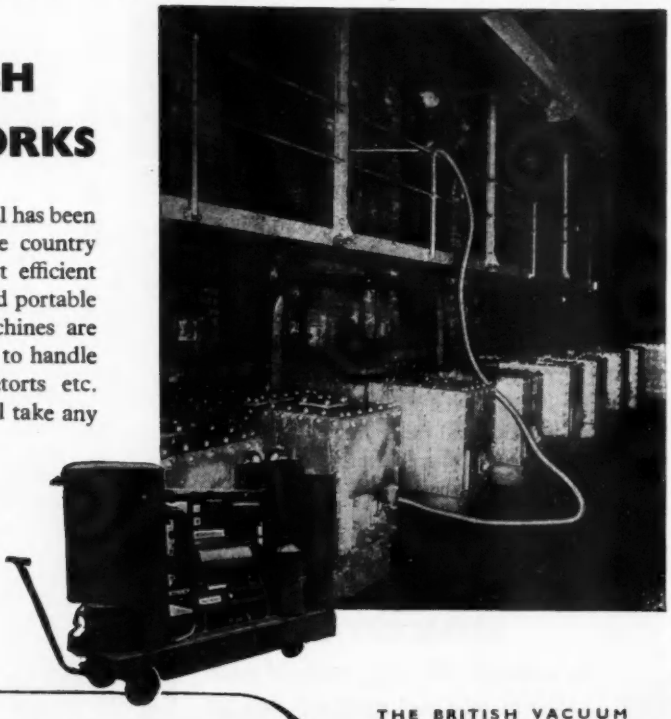

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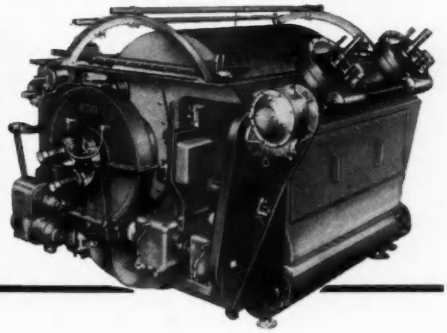

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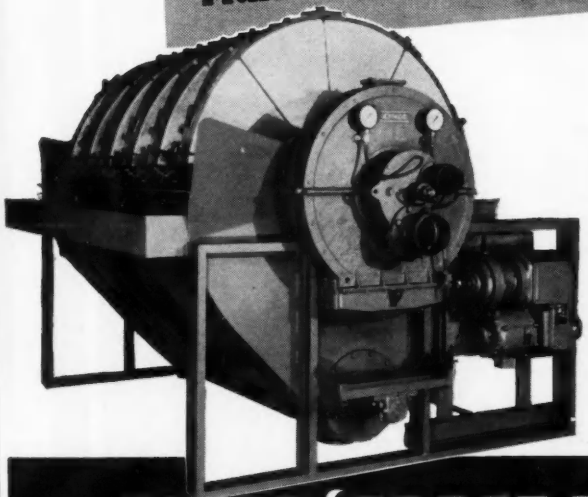

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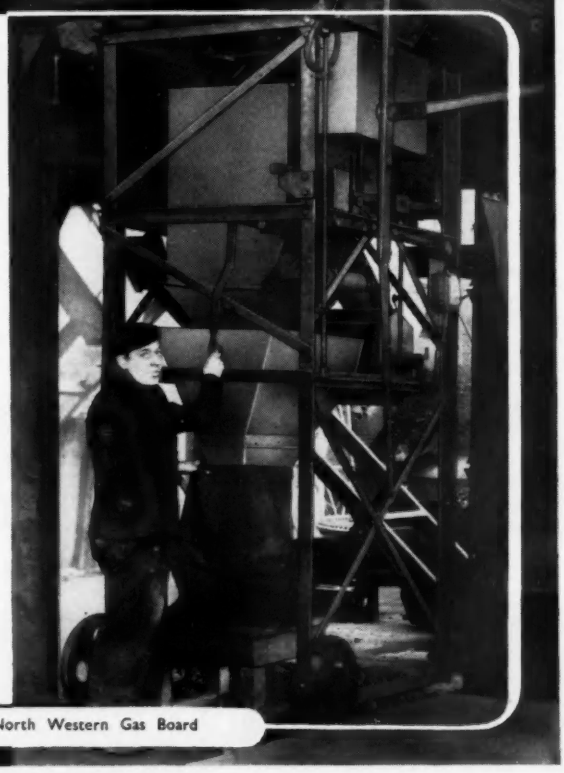

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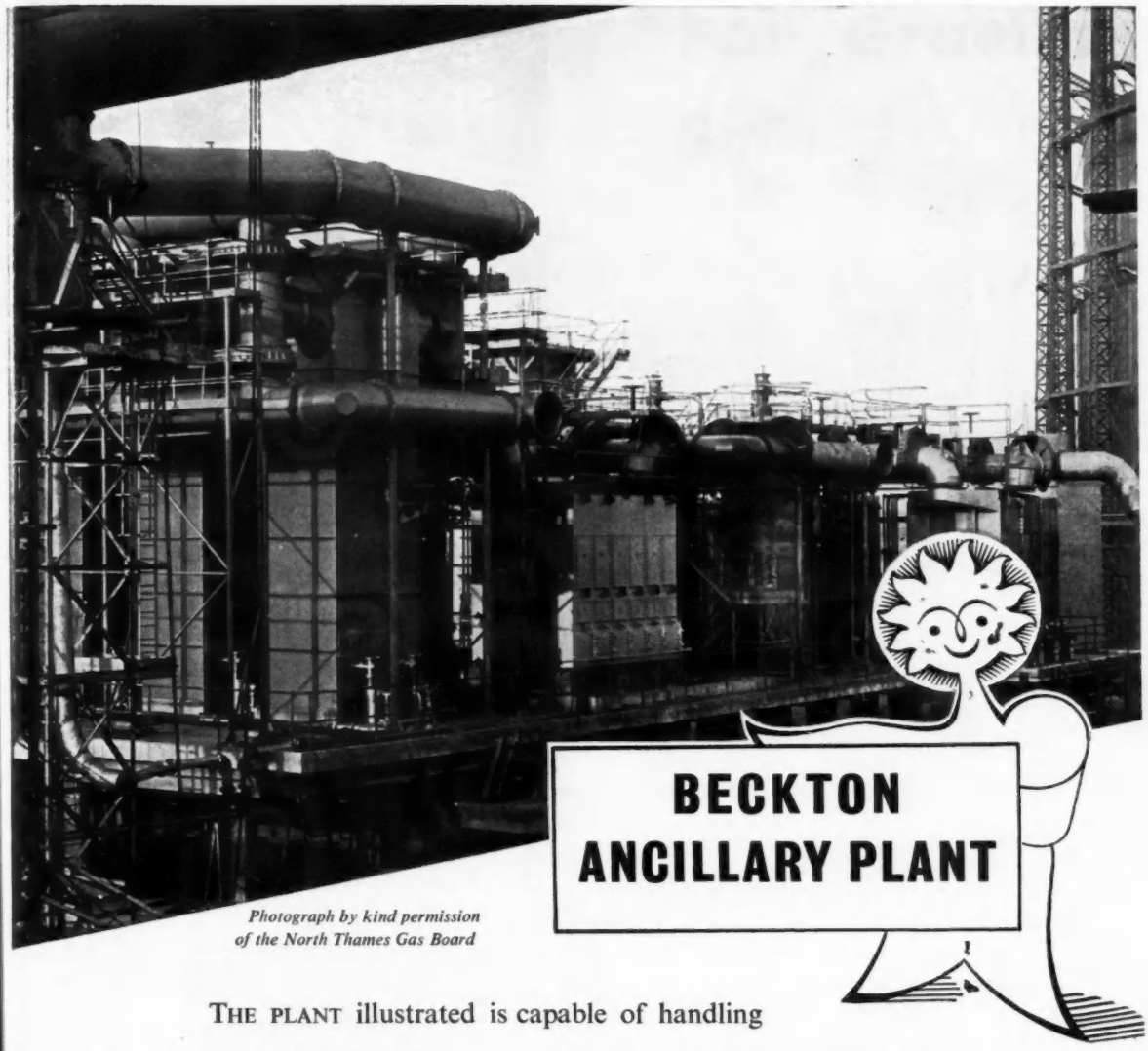

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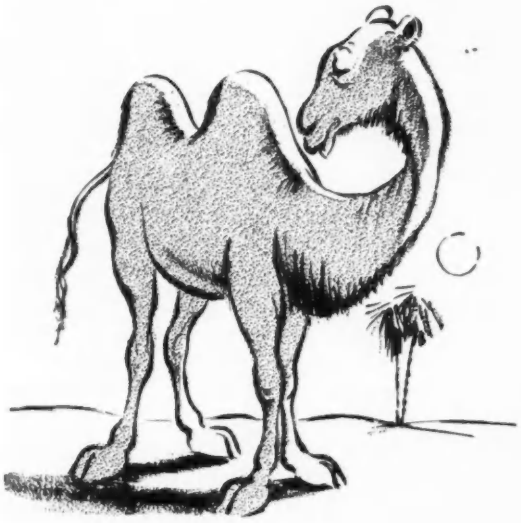

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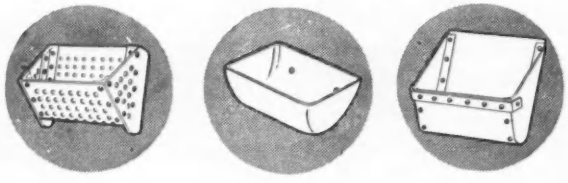

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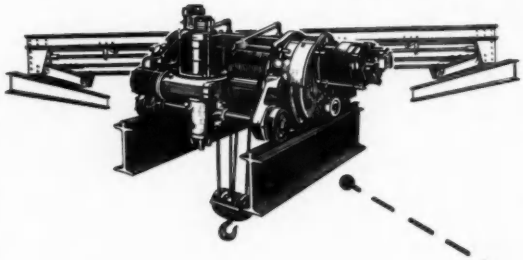

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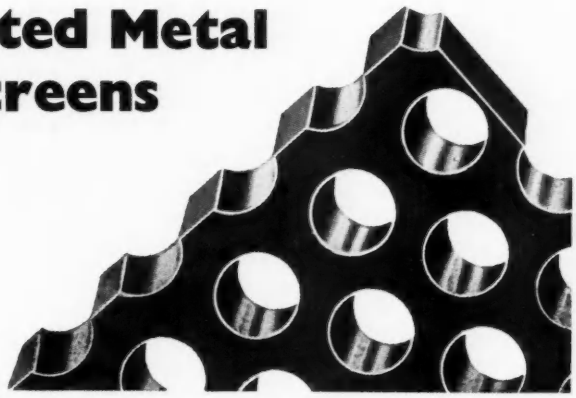

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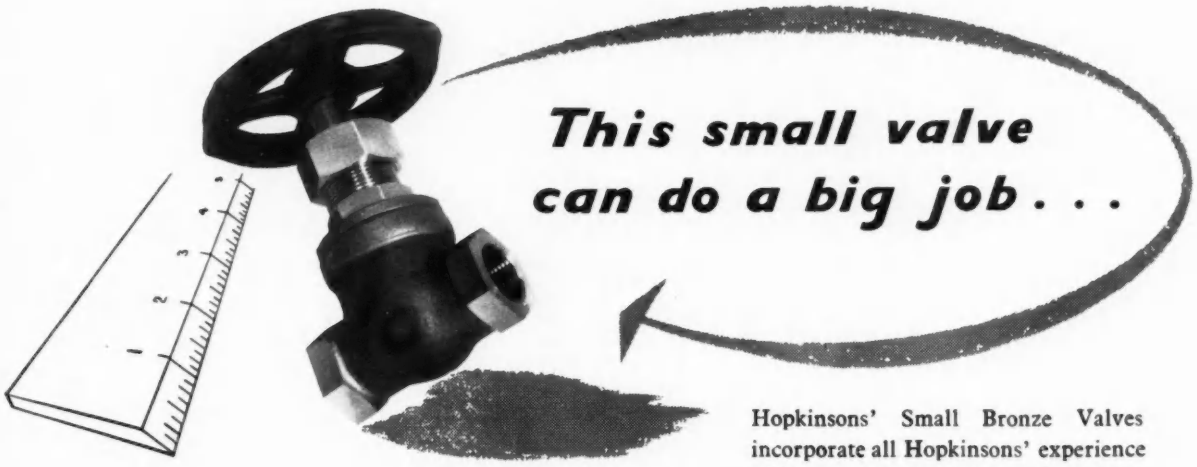

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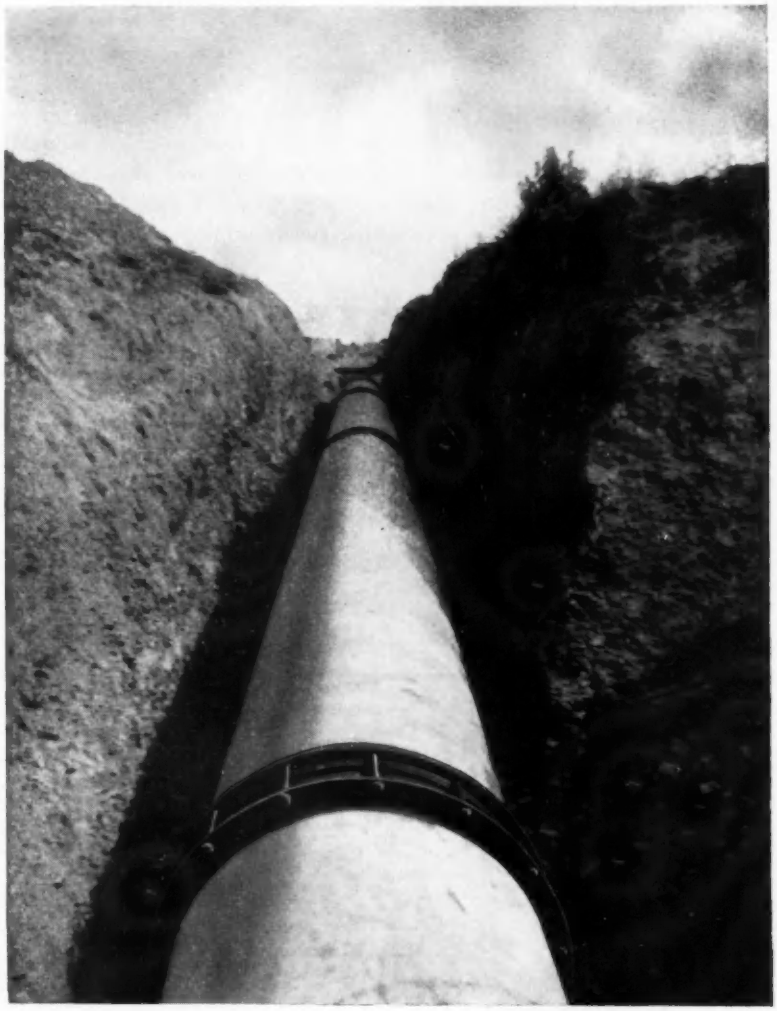

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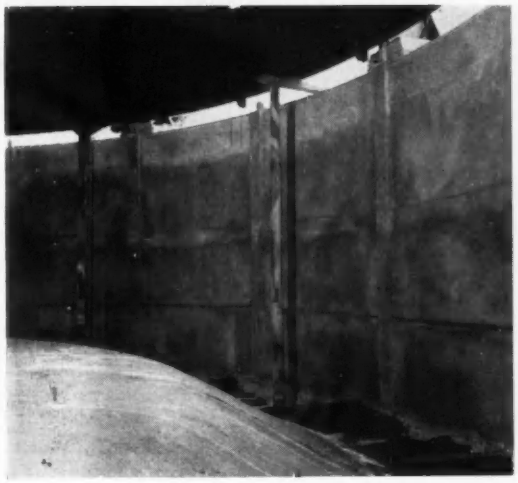

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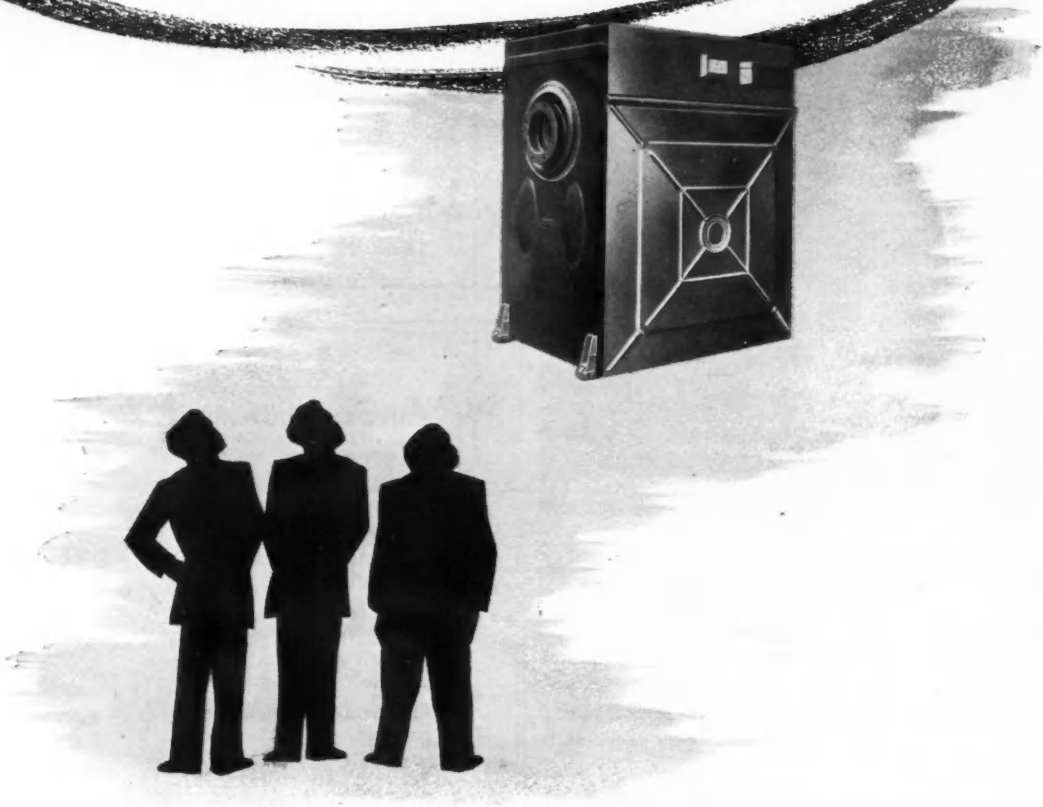

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TG 24

Gas Journal

VOLUME 286. No. 4843. MAY 9, 1956. 108th YEAR

Is There a Cure for the N.C.B.?

EACH Annual Report of the National Coal Board reads like a success story in reverse. The latest tells a sorry story of a loss of nearly £20 mill., bringing its accumulated deficit to over £36 mill., of the lowest output since 1950, and of nearly 6,000 men deserting the industry, of the abandonment of the attempt to maintain substantial coal exports, and of inexorably rising prices. Last year large capital expenditure (over £90 mill.) was spent on the miner. Now it is proposed to spend another £1,000 mill. during the next ten years. As one national daily put it: 'At this rate we shall finish by spending so much that we shall get no coal at all!'

Now comes the news of a further price increase which must have serious repercussions on other industries, our own included. Clearly disinflation has not yet been achieved, and as the *Financial Times* has pointed out: 'What disinflation could do for the coal industry can be measured by the report of 1952. In that year output was 5 mill. tons higher, and 23,000 extra men joined the industry. The one year that was free from inflation was also the best year the Coal Board has had in its nine years of life. The coal industry has been a substantial loser from an inflationary position to which it has made more than its own due contribution.'

However, there is this to be said—that the latest N.C.B. report is honest—almost embarrassingly so—and Mr. James Bowman, the new Chairman, is not one to shirk the issue. He appreciates that we are paying now for our national refusal to pay for coal what it is worth (in a way this is similar to the argument used by the gas industry concerning the cost of coke). The present situation is unpleasant, but our disinclination to face reality has resulted in a foolish effort to avert our gaze from facts which are still more unpleasant, but *facts* nevertheless.

It is easy to criticise, and having expressed our disappointment at the trend of things we propose to turn to a more hopeful prospect—the Coal Board's own plan for the future, as contained in a new publication Investing in Coal. The Chairman has described this as 'a much more reliable and realistic' document than Plan for Coal, which was much publicised five years ago It was then hoped that the industry might reach a deep-mined output of 240 mill. tons by 1965; but now it is thought that such a level could not be reached much before 1970. Fortunately, the Board now has reason to believe that the contribution from opencast coal, something of the order of 10 mill. tons a year—will continue beyond 1965, which was not foreseen five years back. The N.C.B. ought therefore to be able to provide 240 mill. tons in 1965, and possibly 250 mill. tons in 1970—but not from deep-mined coal alone.

Over the next 15 years, some 280 collieries are likely to come to the end of their workable resources. At present, these collieries produce some 30 mill. tons of coal. Here, the loss of capacity is obvious—at a rate of roughly 2 mill. tons a year, but more in the earlier years than in the later ones. The industry's capacity will fall if these dying pits are not replaced by new ones or by new capacity in already existing ones. In addition, the Board is constantly losing capacity in pits that are nowhere near closure. In any pit, even a new one, taking out this year's output means a real loss of potential, which can only be replaced by further development and capacity.

According to Mr. Bowman, capacity losses are equivalent to over 4 mill. tons output a year, and it is reckoned that output would fall by this amount each year through loss of capacity if it was not counteracted by constant new development. This is the annual debit item that has to be offset by new developments before any 'results' can be shown in overall figures. During the first five years or so of nationalisation, the capacity losses were offset quite easily—and substantial increases in output achieved on top of it—because there were many opportunities to improve what might be called the 'degree of capacity utilization.' But these 'easy' opportunities become fewer and fewer as we go along, and meanwhile it takes a long time to bring really new capacity into action.

At the end of 1955 the Board had 167 major schemes completed or in progress, but out of all these 167 major schemes only 20 had been completed; 147 were still 'in the pipeline.' It had spent £128 mill. on major schemes; but all but £11½ mill. was still 'in the pipeline.' By and large, a major scheme does not produce results in the form of output or productivity until it is

completed. 'That is one reason,' explained the Chairman, 'why we seem to have little to show so far for our capital expenditure on major schemes. In fact, the work of major reconstruction, while it is in progress, may actually hamper a pit's current output which you are trying to keep going at the same time.' The 20 completed schemes, taken as a group, show a substantial rise in output over the last four years, while the rest of the industry, even excluding the 'dying pits,' remained stationary.

The new pits being built will not just replace the old ones; they will include every technical improvement, every engineering advance, that can possibly speed the job of coal production and raise productivity. Technical improvements must be used to save men and to use the men they have to the best advantage. Schemes of scholarships and directed practical training are yielding results.

Let us allow Mr. Bowman the last word: 'Without investment, output would inevitably go down, perhaps to the extent of producing by 1965-1970 some 40 mill. tons less than in 1955 or 70 mill. tons less than we hope to produce in 1970 with the investment proposed. That is the true measure of the value of investment in coal . . . Coal, in short, remains as vital to British industrial prosperity as it ever was. And investment is essential to produce the coal. The sum we are proposing to invest in coal is no more than about 10d. for every £1 that is invested in the economy as a whole. It cannot be described as excessive for the industry which is the main source of primary fuel for the whole country.'

The Pipe-nightmare

THE natural gas discoveries in Alberta have brought about something of a chronic sensation. Canadians in general have become almost fanatical about the prosperity that will come to Canada provided the gas can be put to profitable use. But the eagerness of Canadians to utilize the innate wealth of their country is useless unless certain economical and political problems can be overcome. At the present time Alberta is proving and developing over three times as much natural gas as is being consumed. Thus a vast amount of money and effort is being put into the work for only a very small return. There is only one remedy —Alberta must sell to more natural gas consumers.

Years ago there were several markets available, ranging from such Canadian cities as Winnipeg and Vancouver to the unlimited markets of the United States. But this plan did not fall in with the political views of the times and it was decided that a Trans-Canada pipeline would be the most agreeable proposition. Over the years such vast reserves of natural gas have been tapped that Canada alone cannot possibly consume even a fraction of the product. Also, as local oil-men prophesied, the Canadian economy can barely stand the cost of such an expensive and extensive operation.

Nearly all Canadian oil and gas companies are controlled by American cash—a fact which rankles considerably—but the problem of selling natural gas has been intensified recently by opposition from Washington to any Canada to United States pipeline. As we reported on April 11, President Eisenhower did in fact veto the Natural Gas Bill which had previously passed through the U.S. Senate. The Bill authorized the construction of a pipeline through British Columbia to the United States but it was felt that the Senators might have been legislating purely for personal gain as many of them had business interests in the scheme.

The only remaining solution is an all-Canadian pipeline, one which will be paid for and operated by Canada and one which will have no connection with the United States.

So far two ideas have been proposed, but neither has aroused much enthusiasm among Western oil-men. The first idea envisaged the construction of a line using public money, the subsequent operation of the line to be carried out by a private company. Thus the Canadian public would pay the initial expenses via taxes, while any profit that was to be made would go the the company. A more popular suggestion, but one which is still far from satisfactory, is to form a crown company to build and operate a pipeline. This would almost certainly mean subsidizing both consumers and producers. Remembering, however, that the Canadian economy can barely stand the cost of constructing a pipeline, it is obvious that both of these ideas would only involve more American cash in the form of capital loans. Hence neither is very popular. Western Canada, and Alberta in particular, seems to be in a cleft stick—'We haven't the cash to build a pipeline now and we can't afford to wait.'

A third suggestion has been tentatively made. The Canadian Railways should unite with the natural gas producers to form a company. This would eliminate all right-of-way problems and would lower transportation and construction costs. This idea might eventually come to something because it offers a cheap solution.

At the present time, however, no definite solution has been found and every day of delay is wasting Western money.

This time of indecision is something of which Britain might take advantage. The British Government, or British private investors, could step in with an offer of a loan to develop the natural gas industry, even to the extent of paying for the whole scheme. A far-reaching, but not entirely impractical idea, might be for the British to sponsor new manufacturing industries in Alberta itself. These industries could be sufficiently great as to consume the whole of the natural gas production, thus obviating the need for Alberta to sell to distant consumers and obviating the construction of a fantastic pipe-line. These latter ideas can be suggested with the knowledge that the Canadians are better disposed towards accepting British investments than American. But perhaps we may be accused of trying to make a pipe-dream out of what is not far short of a pipe-nightmare.

A Mutual Respect

HOW do what the advertisements describe as 'discerning women' feel about modern gas appliances? It is all very well for Watson House to carry out its exhaustive research work on making gas appliances more economical, more labour-saving, and safer, but the housewife must still have strong feelings on the subject lying uselessly dormant.

In our opinion the North Thames Gas Board did Watson House a great service the other day by calling a 'conference' at the Queen Elizabeth College, Kensington,

London, of about 40 women teachers of housecraft. Here they listened to the Master of Gas Cooker Design, Mr. E. W. Dunning, speaking on his favourite subject, and later, to Mr. C. H. Purkis, who enlightened them about washing machines and washing techniques. The audience was invited to give their opinions on these subjects.

Mr. Dunning, surrounded by visual aids, certainly got down to the heart of the matter. He revealed his interest in the Average Woman's height and in its relationship with the height of a cooker's various units; he described how cookers could fit into a kitchen, free-standing, built-in, or 'distributed about, as in American kitchens.' He won his audience's sympathy when he tackled the difficulty of the design of boiling burners in the light of the multitudinous shapes and sizes of pots and pans and the need for stability. And, of course, he aroused particular interest when he tackled oven heat measurement.

In short, he dealt briefly with every aspect of cooker design and the problems of research. His object clearly, to the observer, was to provide in one half-hour sufficient material to stimulate a flow of debate from which he himself could make notes and thereby glean an articulate cross-section of opinion on different aspects of cooker design. He was not disappointed. For the remaining one-and-a-half hours of that morning session he was the centre of a discussion that Institution Chairmen dream about. And it continued unabated during the lunch that followed.

One fact clearly emerged from the talk by Mr. Purkis on washing machines. Women do not, as yet, appreciate fully the implications of the 'washing machine revolution. Even such an intelligent and perceptive group as the one he lectured failed to respond with anything like the enthusiasm that was roused about cooking. But that does not mean they were not interested. In our view, this fact emphasizes the urgent need for some really determined campaigning to enlighten women on the subject of washing machines. Even though the gas industry is restricted in its advertising, it is up to every manufacturer and showroom to 'educate' the housewife in this matter. Surely hand-washing will not die as slowly and painfully as the coal fire?

We understand that the South Eastern Gas Board may hold a similar conference this year. Undoubtedly Mr. Dunning and Mr. Purkis will lend weight to the argument in favour of extending the idea.

Fifty Years On

HAD it not been for a casual remark made by Sir Harold Smith, K.B.E., Chairman of the Gas Council, it is unlikely that anyone would have known that on May 2 he completed 50 years service in the gas industry. Fortunately the other members of the Council found out in time to entertain him to a celebration dinner at which he was presented with an 1815 English bracket clock as a memento of the occasion. In the circumstances it is perhaps appropriate that we should remember some of the milestones in his career. He first joined the gas industry via the Birmingham Gas Department in 1906, moved to the Tottenham and District Gas Company in 1920, becoming Chief Engineer in 1922, General Manager in 1943, and Deputy Chairman and Managing Director in 1946. He was President of the Institution of Gas Engineers in 1937-38, and has also held the chairmanship of the London and Counties Coke Association, the National Federation of Gas Coke Associations, the Solid Smokeless Fuels Federation, the Federation of Gas Employers, etc.

We were fortunate in being able to add a personal word of congratulation when he joined the gathering of seven British Empire Medallists from the industry, and their wives, at a pleasant celebration last week. It was, we think, typical of Sir Harold that despite an all-day meeting of the Gas Council and an evening engagement he found time to add the finishing touch to an exciting day for these outstanding members of the industry. A photograph of Sir Harold with two of them appears on p. 405.

The Scottish Meeting

A HIGH standard of service was 'desperately important' to the future of the industry, said Mr. Sydney Smith, speaking as Chairman elect, at a recent meeting of the Scottish Association of Gas Managers, at Paisley. He stressed the importance of the gas manager who, he said, represented the board to the consumer, and on whom much of the success of the industry depended. We should like to feel that this remark heralded a change in outlook: Lack of status of the 'local man' has been one of the worst features of nationalisation.

The importance of encouraging members of the Association to give expression to their experiences and opinions was stressed by Mr. William Campbell who said that it should not be the prerogative of divisional and group managers to describe new projects and developments; they would be the first to deplore such an idea, he added. Mr. Campbell also mentioned electrical competition—this is not the first time the subject has been under discussion in Scotland recently. We applaud Mr. Campbell for two innovations: The presentation of two short papers for discussion, and the introduction of a stop light for those taking part in the discussions. As he admitted, neither idea worked, but they did show that a short paper is sufficient—provided that it is controversial.

Sales papers seem to be doomed to failure in Scotland. Such was the experience of Mr. R. J. Gregg in Aberdeen, of Mr. Thomas Smith in Inverness, and of Mr. Bone who, it seemed, said little that pleased his listeners at the Paisley meeting. But the meeting was a memorable one for all that, and warm tribute was paid to Sir Andrew Clow, the outgoing Chairman.

Outlook in Japan

A WELL presented and informative survey of Japan's gas industry has been produced in booklet form by the Japanese Gas Association, of Tokyo. There are some 160 independent gasworks in the country while consumption is virtually restricted to the large cities and their environs, Tokyo, Yokohama, Kyoko, Osake, Kobe, and Nagoya alone accounting for 85% of all gas consumed.

With the clean air policy uppermost in our minds it is interesting to find the complaint made that the Japanese gas industry faces a 'grave situation' owing to inability to dispose of coke! This factor coupled with inadequate supplies of suitable coking coals appears to be the big worry now facing the industry.

The industry is now recovering from a period of acute disruption following the war when gas losses, chiefly due to leakage, rose to 40% of gas distributed. The figure has now been reduced to the pre-war figure of 4%. However, calorific value has not recovered and is extraordinarily low judged by our standards—405 B.Th.U. per cu.ft., a decline of 65 B.Th.U. per cu.ft. compared with the pre-war figure.

Raw materials used in the manufacture of gas in Japan include heavy fuel oil, light oil, and mixed petroleum oil in addition to coke and coal, the latter commodity being partly indigenous and partly imported.

Looking to the future, the need is seen for centralization of gas production and interconnection of gas supply areas by a grid system. There is a five-year plan in operation, but extension of the industry cannot hope to keep pace with demand for financial and other reasons. *Even if all goes according to plan, it is estimated that a million potential consumers will still lack supplies!*

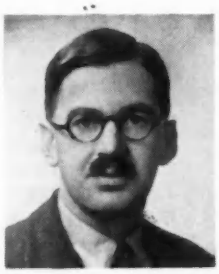
Personal Notes

MAJOR W. R. BROWN has been elected Vice-Chairman of the Power-Gas Corporation Ltd., the Stockton-on-Tees manufacturers of gas, chemical and iron and steel works plant and equipment. MR. T. K. HARGREAVES has been appointed a director.

MR. C. A. F. BENNETT—Ascot Area Manager on the territory of the South Eastern Gas Board—has been selected for the Management Course at Brooklands, which he will be joining on Monday, May 28, 1956. During his absence, Mr. F. C. Hillier will represent the Ascot Company on this territory. Mr. Bennett will resume his duties of Area Manager —with Mr. Hillier assisting him—on his return early in July.

MR. JOHN G. THOM has been appointed Sales Manager for Northern Ireland by British Oxygen Gases Ltd. Mr. Thom has been with the Company for 35 years, and has served in Glasgow, Aberdeen, Leith and Dundee. Aged 49, he is an Associate Member of both the Institute of Welding and the West of Scotland Engineer's Association. Before his new appointment, he was in control of the Company's outside sales staff in the West of Scotland and Northern Ireland.

MR. W. LINDSAY BURNS has relinquished his post as Managing Director of Henry Balfour and Co., Ltd., after 27 years' service. During this time, he has seen the Company grow from very small beginnings into one of the most important and enterprising chemical engineering concerns in Britain. His place has been taken by MR. LINDSAY BURNS, JNR. and MR. I. M. O. HUTCHISON, who will be Joint Managing Directors. Mr. W. Lindsay Burns remains as Chairman and will act in a consulting capacity. Among other responsibilities, Mr. W. Lindsay Burns stays as Chairman and Managing Director of George Scott & Son (London), Ltd., and Ernest Scott and Co., Ltd., as well as Chairman and Managing Director of Enamelled Metal Products Corporation (1933), Ltd.



MR. C. J. P. DE WINTON, T.D., M.A., M.INST.GAS E., M.INST.F., has been appointed Technical Editor of the 'GAS JOURNAL,' and took up his duties at the end of last month. Mr. de Winton, born in 1908, was educated at Eton and Corpus Christi College, Oxford, where he read Chemistry. After going down from Oxford he spent a year at the Imperial College of Science, South Kensington, studying fuel technology, chemical engineering and refractories. He joined the Powell Duffryn Co., Ltd. in 1931 as a carbonizing chemist in the coking and by-products section, and was in due course promoted to Assistant Coke Oven Manager. During the war he served as a Lieutenant in the Royal Artillery, and spent 5½ years in the Far East, most of the time in Malaya and Siam. After the war he was appointed Engineer and Manager of the Chapel Whaley and District Gas Company at Whaley Bridge in Derbyshire, later to become part of the North Western Gas Board. When this works was closed down in 1952, as a result of integration with the North Cheshire Group, Mr. de Winton was appointed Technical Librarian to the Liverpool Group, an appointment he held for three years until promoted to Personal Assistant to the Production Engineer, Mr. W. S. Hubbard.

MR. FRANK C. SMITH, Chairman of the Houston Natural Gas Corporation, and former President (1953) of the American Gas Association has been elected Chairman of the Board of Trustees of the Institute of Gas Technology, Chicago, for 1956. Mr. Smith served as the Institute's first chairman from 1941 to 1944.

Calendar & Directory Alterations

The following changes have been notified during the past several weeks. To keep the information in the current 1956 edition of the Gas Journal Calendar and Directory up to date readers are invited to note these alterations in the Directory Section.

Page D55.—NORTH THAMES GAS BOARD: H. W. Moys, *Staff Controller.*

Page D56.—GROUP 2: C.C. Cunnold, *Group E.*; FULHAM: K. C. Mead, *Station E.*; NINE ELMS: E. J. Edwards, *Station* E.; KENSAL GREEN: A. F. Grant, *Station* E.; BOW COMMON: B. W. Dawkins, *Station E.*; MILL HILL: P. G. S. Fry, *Station E.*; HORNSEY: W. J. K. Ware, *Station E.*

Page D66.—LIVERPOOL GROUP: Delete F. Bell, *Distribution E.*

Page D79.—SOUTH EASTERN GAS BOARD: Delete R. S. Johnson, *Deputy Chairman*; add C. J. B. Sawbridge, *Deputy Chief Accountant*, vice R. N. Barrett, retired.

Page D93.—SOUTHERN GAS BOARD: F. Bell, *Distributing E.*; D. L. Hill, *Training and Education Officer.*

Page D113.—NEWPORT: Delete J. Cowell, *M.*, deceased.

Page D153.—MANCHESTER AND DISTRICT SECTION: J. M. McLusky, *Chairman*; R. L. Greaves, *Senior Vice-Chairman*; J. G. TILLEY, *Junior Vice-Chairman.*

Page D154. — MIDLAND SECTION: J. Corrigan, *Chairman*; F. L. Atkin, *Senior Vice-Chairman*; F. H. Bate, *Junior Vice-Chairman.*

Diary

May 9 and 10.—IRISH GAS ASSOCIATION: Annual Meeting at Portrush. Paper, 'Some Observations on the Smaller Works Practice in Ireland,' J. W. Young.

May 9-19. — MECHANICAL HANDLING EXHIBITION: Earls Court, London.

May 11-13. — NATIONAL INDUSTRIAL SAFETY CONFERENCE, Scarborough.

May 12.—MANCHESTER JUNIORS: Meeting at Garston works.

May 12.—NORTHERN JUNIORS: 'An Unusual Problem of Gum Formation,' F. W. Sawyer. Durham.

May 14-17.—PHYSICAL SOCIETY: 40th Annual Exhibition of Scientific Instruments and Apparatus, Royal Horticultural Society Hall, Westminster.

May 15. — LONDON AND SOUTHERN I.G.E.: Spring Meeting. Annual Luncheon and Chairman's Address.

May 16 to 18.—INCORPORATED PLANT ENGINEERS: Ninth Annual Conference, Hotel Majestic, Harrogate.

May 17.—YORKSHIRE JUNIORS: Joint meeting with Manchester Juniors. Visit to Oughtibridge Silica Firebrick Co. Ltd., Oughtibridge, near Sheffield, 10.30. 'The Character of Silica Products and their Effect on Durability in the Carbonizing Industry,' T. R. Lynam.

May 19.—WESTERN JUNIORS: Visit to South Western Tar Distilleries. Paper, 'The New Gas Works under Construction at Truro,' I. F. Carr. Plymouth.

May 25.—LONDON AND COUNTIES COKE SALES CIRCLE: Annual General Meeting, Connaught Rooms, Great Queen Street, W.C.2. 2.15 p.m.

May 25. — LONDON AND SOUTHERN JUNIORS: Annual Business Meeting. Meyerstein Theatre, Westminster Hospital School of Medicine, Horseferry Road, London, S.W.1. 6.30 p.m.

May 26.—SCOTTISH JUNIORS (EASTERN): Annual General Meeting, Training College, Edinburgh. Postponed from May 12.

May 29-June 1.—INSTITUTION OF GAS ENGINEERS: 93rd Annual General Meeting, Royal Festival Hall, London.

May 30.—SOCIETY OF CHEMICAL INDUSTRY, CHEMICAL ENGINEERING GROUP: Annual General Meeting and Dinner, Café Royal, Regent Street, W.1. 6.15 p.m.

June 2.—SCOTTISH JUNIORS (EASTERN DISTRICT): Annual Outing to Perth.

June 4.—WEST MIDLANDS G.C.C.: Committee Room, Gas Offices, Edmund Street, Birmingham 3. 2.30 p.m.

June 5.—SOUTH EASTERN G.C.C.: Caxton Hall, London. 11 a.m.

June 8.—SCOTTISH JUNIORS (WESTERN): Golf Outing.

B.G.S.A. CONFERENCE CALL TO CUT COST OF LIVING

President Pleads for Stability

MR. William E. Webb, President of the British Gas Staff Association, told 350 delegates to the annual conference at Great Yarmouth on Friday, that while the cost of living continues to rise 'we shall be compelled to table fresh demands for salary increases.' He added: 'But we should all, I feel, welcome a period of stability and security with consequent freedom from this eternal problem of chasing the cat's tail.'

Mr. Webb also said that gas staffs 'viewed with keen regret' the further restrictions placed on credit and hire purchase sales of gas appliances. 'To sell gas we must sell gas appliances and despite the all-too-familiar arguments by critics against the hire purchase system it must be admitted that hire purchase has become a British way of life and is definitely here to stay. There is therefore a strong case for the removal of these irksome restrictions.

Automation and the fears some people have of it were also subject to forthright comment from Mr. Webb.

'Never forget that gas is a growing industry. I am confident that whatever changes the future may have in store the gas industry will be able to absorb those employees who otherwise might be redundant.

'For more years than I care to remember the Jeremiahs have prophesied the downfall of the gas industry, but what are the facts? Under the wise and able leadership of Sir Harold Smith the industry has gone from strength to strength.' Who could doubt, demanded Mr. Webb, that but for the stranglehold of restriction the growth of the gas industry during the past few years would have been phenomenal.

JOINT CONSULTATION

Joint consultation within the gas industry was, on the whole, functioning well, said Mr. Webb. He had recently attended the highly successful conference at Blackpool, organized by the North Western Area Board.

He said: 'The encouragement which the Chairman and the Board is giving to joint consultation has to be heard to be believed, and it might well serve as a pattern for general adoption throughout the gas industry. But gas staffs should remember that they too have a part to play and every effort should be made to render that wholehearted co-operation which is essential if joint consultation is to fulfill its role of promoting progress and efficiency. Nationally we gave our promise to give full support. Let it not be said that the B.G.S.A. failed to implement a promise.'

In the field of industrial relations the gas industry was second to none. The Gas Council was extremely co-operative and well disposed towards the trade unions. They paid tribute to the Gas Council for its broad outlook and for its readiness to compromise in difficult situations.

Of the work over the past year, the President said intense activity within the branches had resulted in increasing membership.

GRATEFUL

Their National Council had played a vigorous and impressive part in the preliminaries which had led to the successful outcome of negotiations which had given members a realistic salary increase and some revision of salary scales; the recognition by the Gas Council of the principle of equal pay for equal work; special and transitionary scales and agreements on transfer; and subsistence allowances. 'We have every reason to be grateful to our negotiators for the very fine work carried out on our behalf.'

While this was being said, members who had accepted office in 1946 stood at Mr. Webb's request.

Mr. Webb opened his address by saying that this tenth annual conference marked a milestone in the history of the B.G.S.A. 'Looking back over the years since that day in 1946 when the B.G.S.A. was born of the fusion of two earlier bodies we find that much which then appeared to be nothing but dreams is now accomplished fact. But it should be remembered that there were those among us in those early days who did not lack vision, and what is more important possessed the courage, initiative and enterprise to press on despite the many difficulties towards the distant goal.'

He continued: 'We may take pardonable pride in the outstanding achievements of the past decade, and to-day the B.G.S.A. stands firmly established as a prime factor for peace and progress in the great gas industry which we so gladly serve.

Mr. Webb delivering his speech.

JAPANESE GAS MEN LEAVE LONDON

LEAVING London recently were two Japanese gas engineers who are making a world tour of gas plant installations.

They were Mr. Shigeo Murai and Mr. Ryoichi Takashima, who are Director and Assistant Chief Engineer respectively of the Tokyo Gas Company, Limited.

The Japanese engineers had already visited the U.S.A. before coming to Britain for one week.

While they were here they visited gasworks at Southall, East Greenwich, Beckton and Stafford and were guided by Mr. J. S. M. Jones and Mr. R. Prior, both of Humphreys & Glasgow, Ltd. Special interest was shown in the Onia-Gegi oil-gas plant and in carburetted water gas plant.

The Japanese are continuing the European part of their tour in France, Germany and Italy.

Mr. Charles Latham, West Bromwich, who received an account and later a demand for the payment of 0d., during a period when no gas was used at his home on April 24, received an apology from the West Midlands Gas Board.

HEAVY PURIFIERS MOVED BY ROAD

Demonstrating why the purifiers could not go through Mersey Tunnel!

HEAVY purifiers from the North Western Gas Board's Ormskirk works have just been moved by road to the Ellesmere Port works, a distance of about 21 miles as the crow flies, but because of the size and weight of the loads the actual journey taken was no less than 185 miles.

The purifiers were far too big to go through the Mersey Tunnel, and the final route chosen was down the East Lancashire Road to Manchester, and then back again along the Chester road to Ellesmere Port.

To make the removal possible, the purifying plant at Ormskirk which was closed down last year was cut into halves. Each half weighed 35 tons, and was 37½ ft. long, 19¼ ft. wide and 12½ ft. deep.

The same vehicle took each half separately to Ellesmere Port. The first journey took 50 hours' running time spread over five days.

Two days spent in moving the first load were on roads which finally proved unsuitable, and a conference had to be called between the moving contractors and the Cheshire authorities before permission was given to cross a Bailey bridge near Chester.

This bridge had to be strengthened with ten tons of sand, 300 ft. of steel plate and 150 wooden sleepers before the heavy loads were sent across it.

Midland Juniors' 'Presidential Outing' . . .

CELEBRATION of 'President's Day' by the Midland Junior Gas Association under the Presidency of Mr. S. C. Crathorn on April 27 comprised a morning visit to the Saltley gasworks, luncheon at the Botanical Gardens, Birmingham, and in the afternoon, a visit to the Gas Council's Midland research station at Solihull.

At the luncheon Mr. Crathorn presided and Mr. G. le B. Diamond, Chairman of the West Midlands Gas Board, proposed the toast of the Midland Junior Gas Association. He said junior gas associations and the Midland in particular had set an example to the seniors in many ways—especially in the high standard of the papers read at the meetings.

The West Midlands Gas Board with their colleagues in the East Midlands were proud of the privilege of entertaining the less senior officers in the industry.

He welcomed to the luncheon Colonel F. J. Bywater, C.B.E., who was the first President of the Midland Junior Gas Association.

Mr. Crathorn, responding, said the undoubted strength of the Midland Association was due to several reasons and among them was that they were fortunate in having a first class team of officers. They had no difficulty about their membership because there were a lot of capable young men coming forward to join their ranks. Also there was one asset which was of great significance and that was the encouragement and support which they received from the area boards.

. . . And Midland Juniors' Annual Meeting

MR. S. C. CRATHORN presided at the annual meeting of the Midland Junior Gas Association, held in Birmingham on April 24. The report and accounts were passed and retiring members of the Council were cordially thanked for the work done during the past year.

The officers were also thanked and Mr. J. Brockbank was re-appointed Honorary Treasurer.

Mr. H. J. Reynolds was re-elected Honorary Secretary and special reference was made to the outstanding service he has rendered to the Association over a long period of years.

YORKSHIRE JUNIORS VISIT GLASS WORKS ON PRESIDENT'S DAY

MEMBERS of the Yorkshire Junior Gas Association to the number of 65 spent their President's Day, April 11, at Doncaster, for lunch at the Danum Hotel by invitation of the East Midlands Gas Board, and afterwards as guests in a tour of the glass works of Pilkington Bros., Ltd., and the Rockware Glass Works Company.

Mr. C. J. Schofield, Chief Engineer, and Mr. J. Davis, Personnel Manager of Pilkington Bros., Ltd., and Mr. Ian Young, General Manager of the Rockware Glassware Company, and Mr. G. C. Ward, Personnel Manager, welcomed the guests. Dr. R. S. Edwards, Chairman of the North Eastern Gas Board, and Mr. G. E. Banks, President of the Junior Gas Association, replied.

The President, Mr. G. E. Banks, presided at the lunch and was accompanied at the top of the table by Dr. Edwards and Mr. C. C. Wood, Divisional General Manager of the East Midlands Gas Board, who was present in the unavoidable absence of Mr. Sydney Smith, the Board's Chairman.

After the lunch Mr. R. H. Anderson, Senior Vice-President of the Association, invited Mr. Banks to give his presidential address. Mr. Banks reviewed events in the gas industry during the last 30 years, particularly the formation and progress of the Junior Gas Associations and the help and benefit gained by members and the industry generally.

Mr. R. S. Carter, Junior Vice-President, moved a cordial vote of thanks to Mr. Banks and at the invitation of Mr. Schofield the party motored out to Sandal Magna where they saw how gas is used for the heat control of the Lehr, the heating of the vitriolite and plate glass tanks, and how towns gas is used for some of the finer processes.

The party were entertained to tea and Mr. Banks warmly thanked Pilkington Bros., Ltd., and the Rockware Glass Works Company for a most interesting afternoon's visit and for their generous hospitality.

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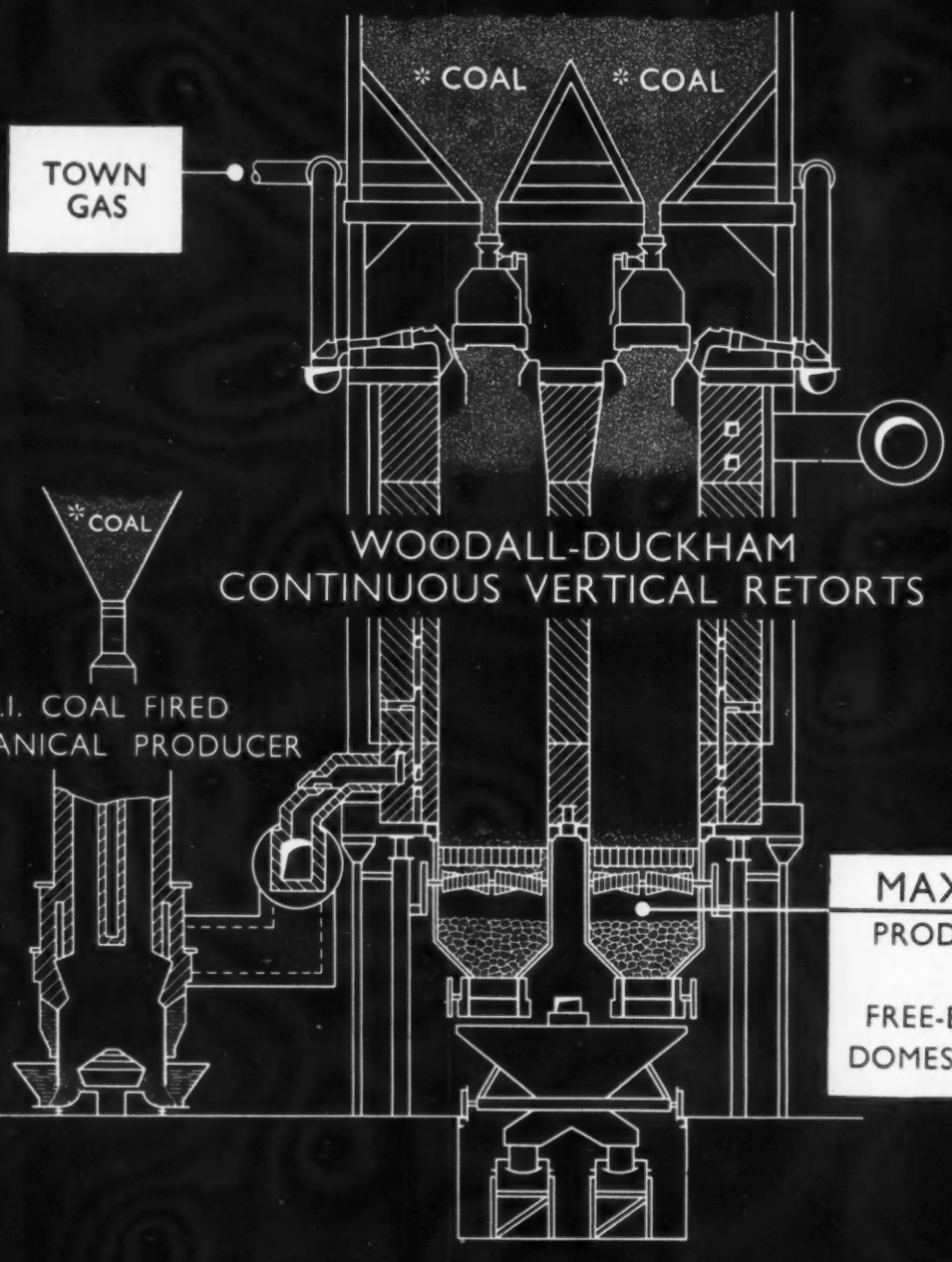

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PARISH COUNCILS' MOVE AGAINST W.M. GAS BOARD

Counsel Retained

SEVEN parish councils which have lodged objections to the West Midlands Gas Board's proposal to build a £4½ mill. gas plant at Coleshill, Birmingham, will meet Meriden Rural District Council to discuss tactics for the forthcoming planning enquiry.

The Deputy Clerk, Mr. R. E. Hale, said at the rural council meeting on April 24, that a date had not been fixed by the Ministry to hear the Board's appeal against the Council's refusal for planning permission. Leading counsel, he said, has been retained to conduct the Rural Council's case.

Many enquiries about the project had been received from people living in the area affected. 'All have expressed concern about the scheme,' Mr. Hale said. 'It is up to them to attend the enquiry or make their views known to the Minister of Housing and Local Government.

Warwickshire Rural Community Council have passed a resolution supporting the objections of the parish councils. It was contended that the plant would be an 'eyesore in a particularly pleasant part of the countryside.'

The proposal is to install plant on the South side of Hams Hall Electricity power station, where gas from coal not usable for other purposes would be made. The special type of installation for this process has already been used with success in Australia and on the Ruhr.

Members on the platform of the metal spun plant.

Manchester Juniors Visit Staveley's

ONE hundred Manchester Juniors visited the Staveley Iron and Chemical Co., Ltd., near Chesterfield, recently. Later in the day Mr. C. G. Partington, of Blackpool, presented his paper, 'Modifications of a Large Holder Station.'

Mr. H. Partington, President, led the Association through the metal and spinning plants, the pit cast section, the concrete lining and bitumen sheathing section, to the Devonshire works and gas engines, and the 'specials' plant.

Mr. M. C. Hanna, Director of the Company, said: 'There are times when we as manufacturers think we know what is best for you.' He welcomed the visitors.

Replying, the President said that as manufacturers of pipes the Staveley Company was an important member of the 'gasworks family.' They were experts in the bolt flexible type of gland and were now developing the screwed gland in small diameters.

At tea, the Foundry Manager, Mr. E. Freer, said in times of higher standards of quality and performance manufacturers wanted to know of the problems of the gas industry. 'Wherever possible manufacturers will do their utmost to co-operate in overcoming difficulties quickly. What must be remembered is that big industrial concerns face their own problems, chiefly connected with the quality of labour, and it is not always possible to do all that they would like.'

The President, Mr. Partington, thanked the firm for the facilities afforded.

NORTH THAMES OFFICIAL ELECTED BENZOLE PRESIDENT

AT the third annual general meeting of The National Benzole and Allied Products Association, Grosvenor Hotel, London, on April 25, Mr. L. W. Blundell, Controller of By-Products to the North Thames Gas Board was elected President to succeed Mr. A. K. Steel of the Carbonization Department of the National Coal Board.

Mr. Steel became the first President in 1954 when the Association was formed to replace N.B.A. Ltd., which had served the industry since 1919, and tribute was paid at the meeting to the work Mr. Steel had done in the transition period.

Mr. H. H. Bates, Chairman and Managing Director of the National Benzole Company Ltd., became Vice-President in succession to Mr. Blundell.

GAS WORKERS RECEIVE B.E.M.

'Here's to the next 50 years.' Was that the toast when Sir Harold Smith, K.B.E., Chairman of the Gas Council, met two gas workers who share with him the distinction of half a century's endeavour for the gas industry? On Sir Harold's right is Mr. J. Lucas, Engineer and Manager of Llanberis Gas and Water Undertaking, Wales Gas Board, and on his left Mr. G. Bennett, a motor driver who recently retired from service with the North Thames Gas Board. They were two of the seven gas industry workers who received the British Empire Medal from Mr. Aubrey Jones, Minister of Fuel and Power, at Lancaster House last week.

Spring Meeting at Paisley

SCOTTISH ASSOCIATION WELCOME MR. SMITH

WHEN the members of the Scottish Association of Gas Managers gathered at Paisley for their Spring meeting on April 27, they found on the platform not only Sir Andrew Clow, Chairman of the Scottish Gas Board for the past seven years, but Mr. Sydney Smith, the man who was to suceed him within four days.

As Mr. Smith, speaking in his double capacity as Chairman of the East Midlands Gas Board and chairman-designate of the Scottish Gas Board, explained: 'At the beginning of June last year, during the annual meeting of the Institution of Gas Engineers in Portsmouth, your President, Mr. W. C. Campbell, kindly invited me to attend this meeting as a guest. I readily agreed for two reasons: My former association with Paisley throughout the war years, and the fact that I had known Mr. Willie Campbell from the time when he was assistant to Mr. David Fulton in Helensburgh.

'When I agreed in June to come here to-day, neither your President nor I had any idea that within a very few days from now I should be returning once again to Scotland to follow Sir Andrew Clow and once more to join so many friends and former colleagues.'

The conference opened with a civic welcome from Mr. Allan McLean, Provost of Paisley.

Mr. Campbell, paying tribute to Sir Andrew Clow, said that he had been a steadfast supporter of their Association. 'This is the last occasion on which he will be present as the Chairman of the Scottish Gas Board, and on behalf of all my predecessors in office and all the members I thank him most sincerely for all he has done to watch our interests.'

Sir Andrew Clow, replying, said: 'It is always rather a sad thing to say goodbye, but I welcome very greatly the privilege of being here for that purpose. Like the Board, I was something new imposed on most of you. I fully appreciated the doubts and difficulties that must have been dissipated among a good many about our work.'

CO-OPERATION

'One of My Regrets'

One of the things to which we attached real importance was the fact that the new order brought 'an even greater degree of co-operation than you had known before nationalisation. I do not mean co-operation with the Board and its officers, but co-operation among yourselves. One of the real regrets I have is that the heavy work of this office has prevented me from going about and seeing a great deal more of you and of consulting you than I found possible. I have no doubt that my distinguished successor, whom I wish all success, and my colleagues will find that a little easier in the times to come and will fulfill it.'

Mr. W. K. Hutchison, President of the Institution of Gas Engineers, opened with a tribute to Sir Andrew Clow. 'We have been colleagues on the Gas Council since its inception,' he said, 'and we on the Council are losing a very valuable friend, with a very keen intelligence and a power of criticism which is invaluable to the public service. Sir Andrew was never a "Yesman." We are sorry to lose him.'

Mr. Sydney Smith, referring to Sir Andrew Clow's comment on co-operation, said: 'I think the gas industry today will measure its success from that thing alone. I call it team work rather than co-operation. It is from meetings such as this one that that team work will be engendered because of the friendliness and trust between one member and another.'

THE MINISTER

A Helpful Function

Mr. O. Francis, Under Secretary, Gas Division, Ministry of Fuel and Power, said it was his view, irrespective of the economic climate in future years, that a close and searching scrutiny of the industry's capital would continue to be insisted upon by Parliament. 'I hope that will be recognized as a helpful function which the Minister performs—helpful in the sense that it is in any event quite essential to good management in the industry.'

He added: 'There has been a certain tendency in some quarters to write off the gas industry, but the gas industry has a most amazing resilience. Now you are faced with the tremendous opportunity of the Clean Air Bill, which will shortly become an Act. I believe that the gas industry has two underlying sources of strength that will enable it to rise to this opportunity. One is that the gas industry has throughout its life lived in a harshly competitive environment. You have had no luck there, as your competitors have. You have to meet and overcome a challenge in every market in which gas is supplied. That proves an attitude of mind and an ingenuity which will stand the gas industry in good stead. The other source of strength is its organization. Each of the area boards is entirely autonomous and master of its own house.'

Following the President's address and the proposal of a vote of thanks to him by Mr. W. M. Gledhill, seconded by Mr. G. Hannah, the members heard papers read by Mr. R. H. Bone, Scottish Gas Board ('Remember! It's Better by Gas') and by Mr. A. F. Pollock, Scottish Gas Board ('Whither Tariffs?').

Mr. Campbell presided at the lunch which followed in the Geo. A. Clark Town Hall, when the toast list was sustained by the following: 'The Gas Industry,' Mr. D. Johnstone, M.P. for Paisley; reply, Mr. W. K. Hutchison, President of the Institution of Gas Engineers; 'The Town and Trade of Paisley,' Mr. A. T. Herd, Secretary, Scottish Gas Board; reply, Provost A. McLean; 'Our Guests,' Mr. J. M. Dow; reply, Mr. Sydney Smith; 'The Chairman,' Mr. D. Fulton, Helensburgh.

In replying for the guests Mr. Smith said: 'The Scottish Association of Gas Managers carries a great tradition. Among its past presidents are many famous names of persons upon whose life-work and original thinking the reputation of the gas industry in Scotland has been built over the past 50 years and more. We have to maintain and, if possible, improve on that tradition, which I suggest can be contained in the one word: Service. It is as well to remember that everything we do—our research, our production, our distribution, and our sales and service policy—is directed towards this one all-important end.

'I would like to pay tribute to the work and influence of the district sections of the Institution of Gas Engineers and the affiliated associations.

> **'After seven years of nationalisation we are beginning, as an industry, to see the fruits of our earlier planning; and, without exception, every gas board in Britain is in a position today to point to very substantial economies, which have resulted, and will continue to result, from the provision of bulk supplies of gas through the integration of undertakings, enabling uneconomic manufacturing stations to be closed down; from increased efficiency of production; and from many other directions which would not have been possible without the resources upon which we are now able to draw.'**

The successful execution of these projects, and the economies resulting therefrom, had been largely brought about by team work, said Mr. Smith, and that team work had its origin in the members of associations such as theirs.

Proposing a vote of thanks to the president for his address, Mr. W. M. Gledhill said those who had known Mr. Campbell and had watched his advancement in the gas industry, would appreciate his keen desire to express views upon certain subjects which had always been nearest to his heart. He referred in particular to the application of commercial policy to counteract the vital problems associated with increasing competition from alternative fuels, and in particular electricity and oil.

Mr. George Hannah, Junior Vice-President, seconded.

MR. GRIEVE WINS 'WINSON SCOTT' CUP

Fine Day for Spring Competition

IN excellent weather the Spring Competition of the Scottish Association of Gas Managers was played at Kilmacolm Golf Club on April 26. The results were as follows:—

		Score
Winner of 'Winson Scott' Cup	T. Grieve	81 *less* 12 = 69
SECTION I		
First Prize	T. Grieve	81 *less* 12 = 69
Second Prize	E. G. Smith	80 *less* 10 = 70
Third Prize	D. D. Burns	80 *less* 7 = 73
Fourth Prize *tie*	G. E. Jeffs	84 *less* 10 = 74
	R. F. Bell	83 *less* 9 = 74
	J. M. Daw	82 *less* 8 = 74
SECTION II		
First Prize	D. D. Melvin	88 *less* 13 = 75
Second Prize	J. B. Plattie	92 *less* 16 = 76
Third Prize	J. M. Praties	97 *less* 20 = 77
Fourth Prize *tie*	J. E. Clark	98 *less* 20 = 78
	D. Mungall	94 *less* 16 = 78
	L. B. Steele	96 *less* 18 = 78
VISITORS		
First Prize	Philip Holt	75 *less* 6 = 69
Second Prize	A. Mitchell	95 *less* 20 = 75

At the meeting afterwards, the Captain, Mr. J. Cooper, welcomed the President of the Association, Mr. Wm. Campbell. Apologies for absence were received from Mr. Clifford King, Mr. Ronald Glover and Mr. J. T. Taylor. The Captain then presented the prizes. To the welcome to visitors Mr. Philip Holt (Newton, Chambers) replied, and Mr. Grieve made the winner's traditional ovation. Mr. Cooper then proposed a vote of thanks to the Kilmacolm Golf Club, the Stewards and to the Secretary of the Circle, Mr. W. P. Rae. Mr. James Dow replied, and proposed a vote of thanks to the Captain, which he briefly acknowledged.

'I wouldn't take it even if I had won!' a probably envious fellow competitor seems to be saying to the winner of the 'Winson Scott' Cup.

Scottish Bowls at Paisley

THIRTY-TWO MEMBERS TAKE PART

THIRTY-TWO members of the Scottish Association of Gas Managers' Bowling Club took part in a competition held on the Barshaw Park Bowling Green, Paisley, on April 26.

The winning rink was as follows:—

J. S. Ednie	..	Crieff (Skip)
J. Scobie	..	Stonehaven 14 *shots up*
D. Philp ..	..	Denny
G. S. McNair	..	Huntly

Runners up—

W. Gilchrist	..	Cowdenbeath (Skip)
W. Gray	..	Edinburgh
A. Briggs	..	Buckie
D. Lambie	..	Coatbridge

Prizes were presented by the President, Mr. John Ford, Inverness. He thanked the Corporation of Paisley for granting the privilege of the use of their green.

Wales and Mon. Juniors Tour Caerphilly Railway Works

A TOUR of British Railways locomotive works at Caerphilly marked the opening of the 1956 programme of the Wales and Mon. Junior Gas Association. Gas is used extensively throughout the works, which is responsible for the repair and maintenance of locomotives and carriages for a large proportion of the Western Region's rolling stock and consumption varies up to 360,000 cu.ft. per week.

Controlled directly from Swindon, the works boasts its own private train and railway station which is a unique feature in the Region. Locomotives come in for complete overhaul after some 100,000 miles and pass through the erecting shop where they are stripped and rebuilt.

Tyring Department

One of the biggest users of gas is the tyring department in the wheel shop where between 18,000 and 40,000 cu.ft. are used in a week. Here high grade steel tyres, which have been machined to fine limits on the giant lathes, are hoisted into the tyring bay where they are placed in a shallow well.

Sixteen curved burners are placed around the tyre which takes about 20 minutes to reach the required temperature and consumes approximately 200 cu.ft. of gas per operation. The gas is supplied at town pressure through an 1,800 cu.ft. Willey meter to a Selas gas mixer and booster which raises the pressure to 1½ lb.

Gas is also used in the bearing department where gas fired pots keep tinning and white metal at constant controlled temperatures of 312°C. and 385°C. respectively.

In the spring shop a bank of three furnaces has replaced a coal fired furnace after doing some 40 years service at Swindon. Giving greater heat control are two Electroflo controlled at 1,000°C. for shaping leaves and hoops. The other is maintained at 700°C. for tempering. Each furnace is fitted with between eight and ten burners on each side and these are lit alternatively and automatically to give uniform temperature throughout the furnaces.

A further gas fired furnace is shortly to be installed in this shop. On order from the Incandescent Heat Company, it will replace existing coal burning equipment, and will be used for preparing spring plates for nibbing and slotting.

Smithy Shop

In the smithy shop, case hardening is carried out principally by means of two gas fired furnaces operating at 900°C. Steel pins and other parts are placed in boxes containing Eternite case hardening material and fired for 6½ hr. From there they are transferred to a coal furnace and subsequently immersed in oil at 700°C. Finally they go into water and emerge with a hardened case $\frac{1}{32}$ in. deep.

At the other end of the smithy is a profile cutter using a mixture of coal gas and oxygen which will slice through ½ in. steel plate at the rate of 60 ft. an hour. Oxygen is introduced under pressure and the flame gives a sharp edge. Acetylene which is inclined to waste down the edge of the work is however used for metal between eight and 14 in. thick.

Consumption in the smithy varies between 15,000 and 45,000 cu.ft. per week.

Both acetylene and oxygen are on tap throughout the works, the oxygen being brought in in liquid state at 180°F. passed through a 14,000 cu.ft. exaporator and into nine cylinders at 1,500 lb. per sq. in. Coal gas comes from the town supply and a water seal is provided at the works.

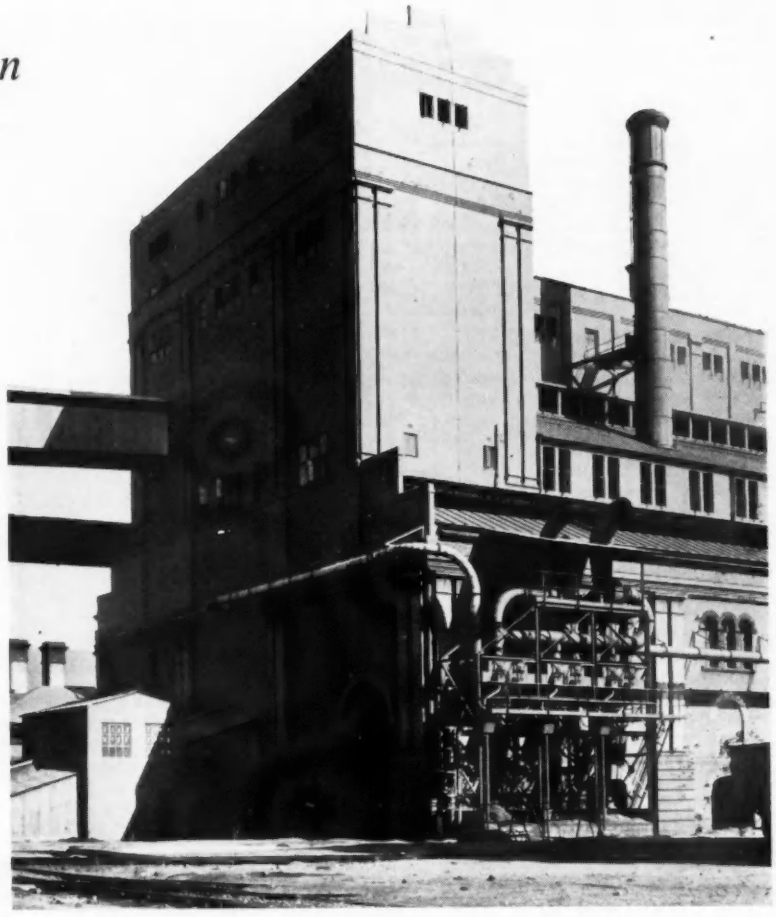
Under a different section and controlled from headquarters in Cardiff, the carriage shops employ gas fired paint scrapers and other equipment which consumes something like 8,000 cu.ft. per week.

GAS AT GRANTON

Extensions Add Ten Mill. Cu. Ft. a Day to Capacity

Last week we reported the inauguration of the extensions at Granton gasworks, a ceremony attended by Sir Andrew Clow, Chairman of the Scottish Gas Board, and notabilities of the Gas industry in Scotland. In this article the new installations are described and an impression is given of the growth of this important works.

Photographs illustrating this article are reproduced by courtesy of Coke and Gas.



The retort house in which new plant has been installed.

GAS was first manufactured in Edinburgh in 1817 at the works of the Edinburgh Gas and Light Company in New Street and was followed by the founding of the Edinburgh and Leith Gas Light Company in 1823. These two companies competed with each other until 1888 when they were amalgamated to form the Edinburgh and Leith Corporation Gas Commission, the total manufacturing capacity of which had reached 10 mill. cu.ft. a day by 1898.

New Site Purchased

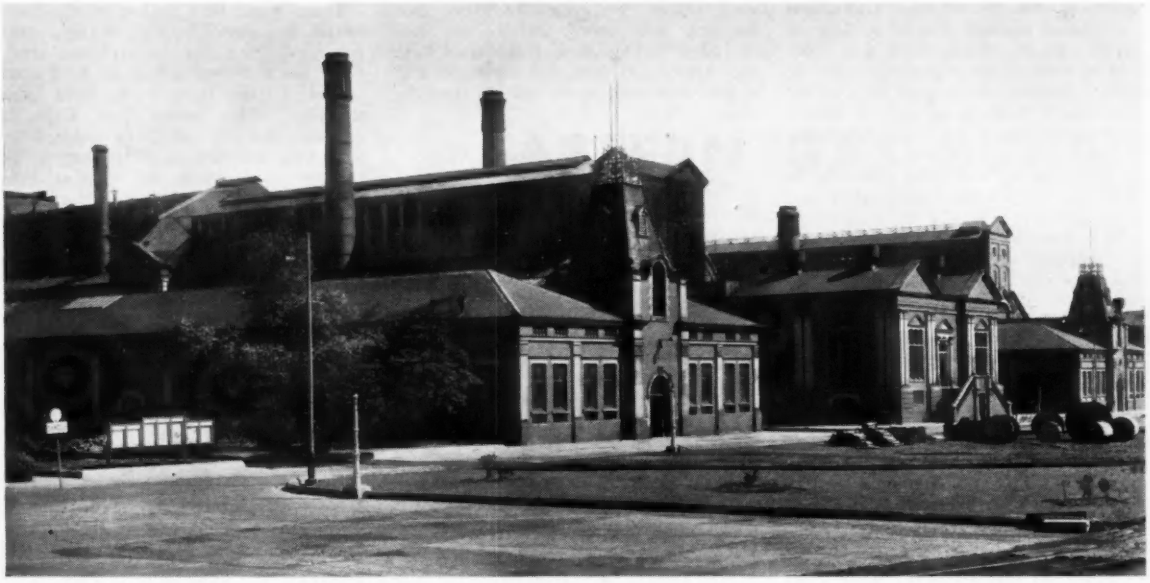
Mr. W. R. Herring had been appointed engineer to the commission, and it was becoming clear to him that if the demand for gas continued to increase at it's present rate, it would soon be necessary to extend the Commission's manufacturing plant. As there was no room for expansion on either of the two sites on which the works were situated, Mr. Herring advised the purchase from the Buccleuch estate of an 110-acre site at Granton. It is on this site that the present works stands, and thanks to the unusual foresight and the exceptional engineering skill of Mr. Herring, the original buildings are still in use, and even some of the plant he installed. The buildings, built of brick with stone facings, are so designed that they give a distinguished and dignified appearance to passers-by on the West Granton road to the south of the works. The type and general design of any buildings put up to house later extensions have been carefully chosen to harmonize with this pleasing façade.

In the original layout of the works, the most careful attention was paid to the handling of coal and marshalling of wagons, so that it was not difficult to adapt the early design to modern conditions. Almost all the coal carbonized at Granton comes into the works by rail, direct from the Scottish coal fields, in the Lothians and central Scotland, and some from the north of England. Coal is, however, occasionally imported from abroad and comes by sea into Granton harbour, and thence by rail or delivered direct by road.

The wagons are brought into the works from the east side, marshalled in sidings within the works area and from there taken as required by the Board's own locomotives (four coke-fired saddle-tanks manufactured by Andrew Barclay). From there, through to the south side in front of the retort houses, the wagons are shunted to the tipplers either between the main buildings or to the new coal handling plant situated at the north side. Here the empties can be marshalled once more and passed to the coke screens which are conveniently placed nearby, loaded and returned to the main marshalling yard or immediately despatched without interfering in any way with incoming traffic. The wagon tipplers used for the original vertical retort benches, known as A, B, C, D, and E, are the hydraulic end tipplers installed at the works by Mr. Herring in 1904. Further branches from the main works sidings system extend to the coal stocking ground, which has a capacity of 40,000 tons, and to the residual products works, passing the coke stocking ground on the way.

Matching Buildings

The Granton Works was one of the earliest to install the inclined retort and these were in use until the late 1920's. The first benches of Woodall-Duckham vertical retorts were installed to form A



The visitor's first view of the works.

and B benches and consisted of 44 76 in. retorts in each bench, the new retort house being built to match the old. The house was opened by King George VI, then Duke of York, in 1926. A few years later the benches of inclined retorts were replaced by W-D. vertical retorts, and in 1931 a bench of 44 103 in. retorts with external step grate producers was installed.

Later, in 1937, this setting was reconstructed to form two benches of 20 retorts, known as C and D benches. The total capacity of C and D benches (or, as they are now known, Edinburgh No. 2) is 6 mill. cu.ft. a day, carbonizing 390 tons of coal. Benches A and B (now known as Edinburgh No. 1) were reconstructed in the 1940's and have a present-day capacity of 10 mill. cu.ft. a day, carbonizing 635 tons of coal.

Half Occupied

The housing capacity for these retort benches is so much greater than that necessary to contain the carbonizing plant that in actual fact only about half the house is being occupied by the setting, comprising Edinburgh No. 1 and Edinburgh No. 2 respectively. In the latter house the remaining space is used for coke storage, but in the former a further two benches have lately been installed, F and G benches, or known collectively as Edinburgh Nos. 4 and 5. This is the newest extension and consists of two benches, each of 28 82 in. lambent heated W-D vertical retorts, built at the north end of the number two house. It was to inspect this latest extension, complete with coal handling plant, and ancillary plant that the guests were invited last month.

The coal handling plant for these new benches is at the north end of the No. 2 retort house and consists of two electrically-operated side discharge tipplers, each with a capacity of 100 tons. Under these tipplers are 25 ton capacity hoppers and coal conveyors to the retort house bunkers. On its way to these bunkers, the coal is passed through crushers, though small coal can be made to by-pass these. A Boxmag 70 in. suspension magnet is provided to remove any tramp iron that may have accidentally become mixed up with the coal, before it reaches the breakers. After crushing, the coal is taken to the top of the retort house by a lip bucket elevator where it is distributed to the different coal bunkers by means of further belt conveyors and a reversible shuttle conveyor. These are all duplicated in case of breakdown.

To provide for the lip bucket elevator which travels round the north end of the No. 2 house an extension had to be built. This has been carefully designed to fit in with the general design of the buildings and is both functional and pleasing to look at. These lip bucket conveyors, which have a carrying capacity of 100 tons per hour, can be used for taking run-of-retort coke to the retort house bunkers for use as producer fuel or for retort filling after scurfing, or for starting up retorts after repairs. To carry out this operation, coke is drawn from the bottom of the retort into a hand-operated moveable hopper running

Gas offtake level showing auxiliary coal hoppers and coal valves, gas offtakes and retort top ironwork.

on wheels under the settings. This allows a controlled amount of coke to flow on to two belt conveyors which can either transfer coke to the above-mentioned lip bucket elevator, to transport coke to the retort house bunkers, or else by reversing the direction of the conveyors, transfer coke in a southerly direction to a drag bar conveyor by which the coke can be taken for use on the Edinburgh No. 1 retort bench.

On being elevated to the top of the retort house, the coke is either taken direct to the retort filling hopper or, alternatively, can be debreezed and sent to the producer fuel bunkers (the breeze being stored in a suitable bunker and drawn off into lorries at ground level), and any surplus run-of-retort coke is passed out to the yard conveyors for screening in the new screening plant and loaded into wagons.

Independent Working

Each bench of 28 retorts is divided into two equal halves of 14, separated centrally by an air cooled division. Each half of the bench can be worked independently of the other half. It can be let down for repairs while still keeping the other half working normally. Each retort can be individually controlled by the provision of the necessary producer gas, secondary air and waste gas dampers, and thus each retort can be individually adjusted to give the best possible heating conditions; additional secondary air inlets above the main nostrils helps considerably the temperature zoning in the combustion flues.

The retort faces and combustion chambers are built from silica material in the zones of maximum temperature, but in the upper and lower portions fireclay is used. The retort ironwork includes cast iron auxiliary coal hoppers, coal level indicators, explosion doors, coal valves, two-hour auxiliary coke hoppers, and water sealed coke dischargers. Gas offtakes of the liquor flush type are of cast iron. Each is fitted with a dish valve and can be isolated from the main.

Steam for Blast

The retort benches are fired by producer gas from five Humphreys and Glasgow mechanical producers, four of which are normally in operation with one as stand-by. In addition to heating the retort settings, these producers provide 4,200,000 cu.ft. of gas for dilution. The top part of the generator is lined with refractory material and carries the charging gear while the lower half includes an annular boiler which raises steam at 25 lb. per sq. in., and provides all the steam used for saturating the blast. Each producer has its own cyclone dust separator which extracts 90% of the dust from the gas before it enters the setting. Blast is provided by centrifugal air blowers and the predetermined blast pressure is governed by an Askania regulator. Fuel for the producers is drawn from the overhead bunkers into a two-sectioned hopper and is provided with a means of weighing the charge. This hopper is moved over to the appropriate producer by means of an electrically-operated device running on an overhead runway beam. The producers have mechanically-operated grates and the withdrawal of ash can be controlled by the operator to suit the state of the fire as shown by periodical testing. There are gas collecting mains on either side of the setting which are connected to a foul main and to a collecting main.

At the southern end of the retort house is a building containing exhausters and condensers and in a similar building to the adjacent house are the necessary detarrers and washers.

Three waste heat boilers of the horizontal fire tube, induced draught type are provided at the retort house level. Each can deal with all waste heat from 28 retorts, the third being used as a stand-by. The boilers, 8 ft. 6 in. in diameter and 16 ft. long are designed for a working pressure of 180 lb. per sq. in. Draught is induced by Sirocco fans driven by 30 h.p. electric motors connected to one end of the shaft and to the other end is connected a 30 h.p. noncondensing steam turbine by Greenwood and Batley to act as a stand-by. Feed water is provided by steam driven pumps which can deliver water at the rate of 1,280 gal. per hour. A feed water heater is also provided. The boilers, provided with superheaters giving a 100°F. superheat, deliver into high pressure superheated steam mains and also into low pressure mains to provide for retort steaming.

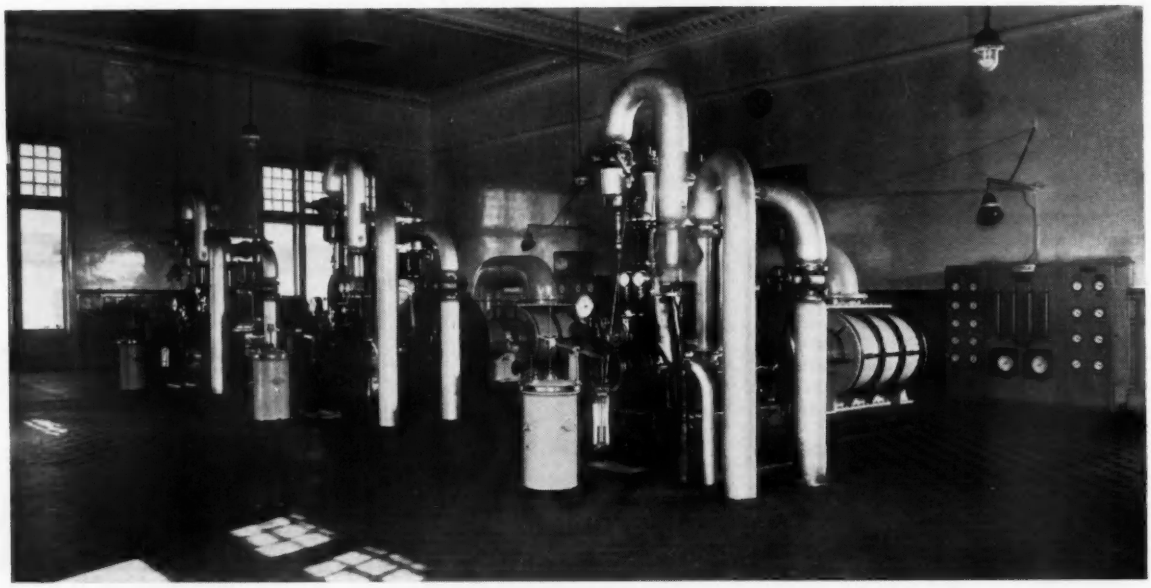
The Exhausters

The exhausters consist of three sets of Bryan Donkin, Holmes Connersville exhausters, steam driven, with a total capacity of 30 mill. cu. ft. a day.

Every section of the new plant is well provided with instruments. This applies especially to the Humphreys and Glasgow mechanical producers and to the exhaust house. In the latter especially, instruments are provided to give information about the gas temperature in the condensers, the state of the condenser water, and pressure measurements at all important points.

In addition to the new carbonizing plant, new screening plant has been provided with a capacity of 50 tons per hour and a storage capacity of a thousand tons.

The completion of this last extension adds 10 mill. cu.ft. a day to the gas-making capacity of the Granton Works.



The three Holmes Connersville exhausters serving A, B, F, and G benches.

1956

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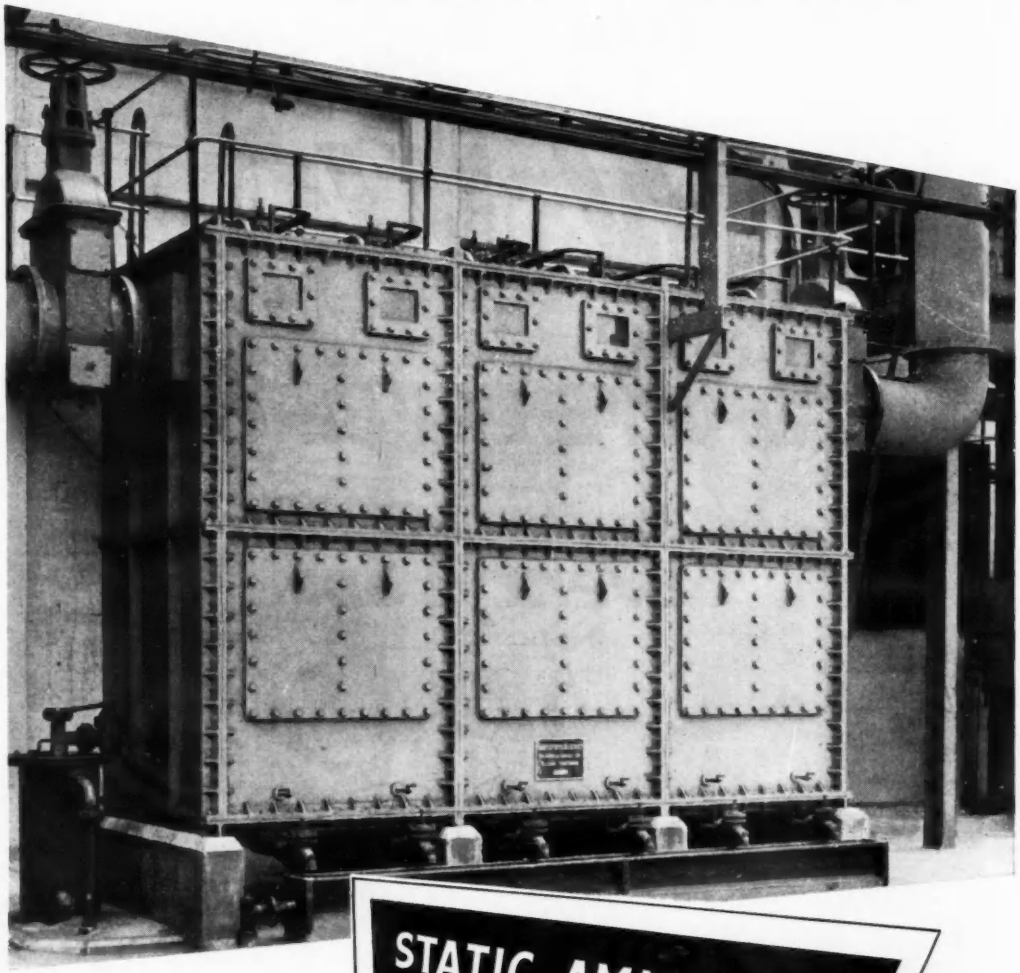
EASTERN GAS BOARD



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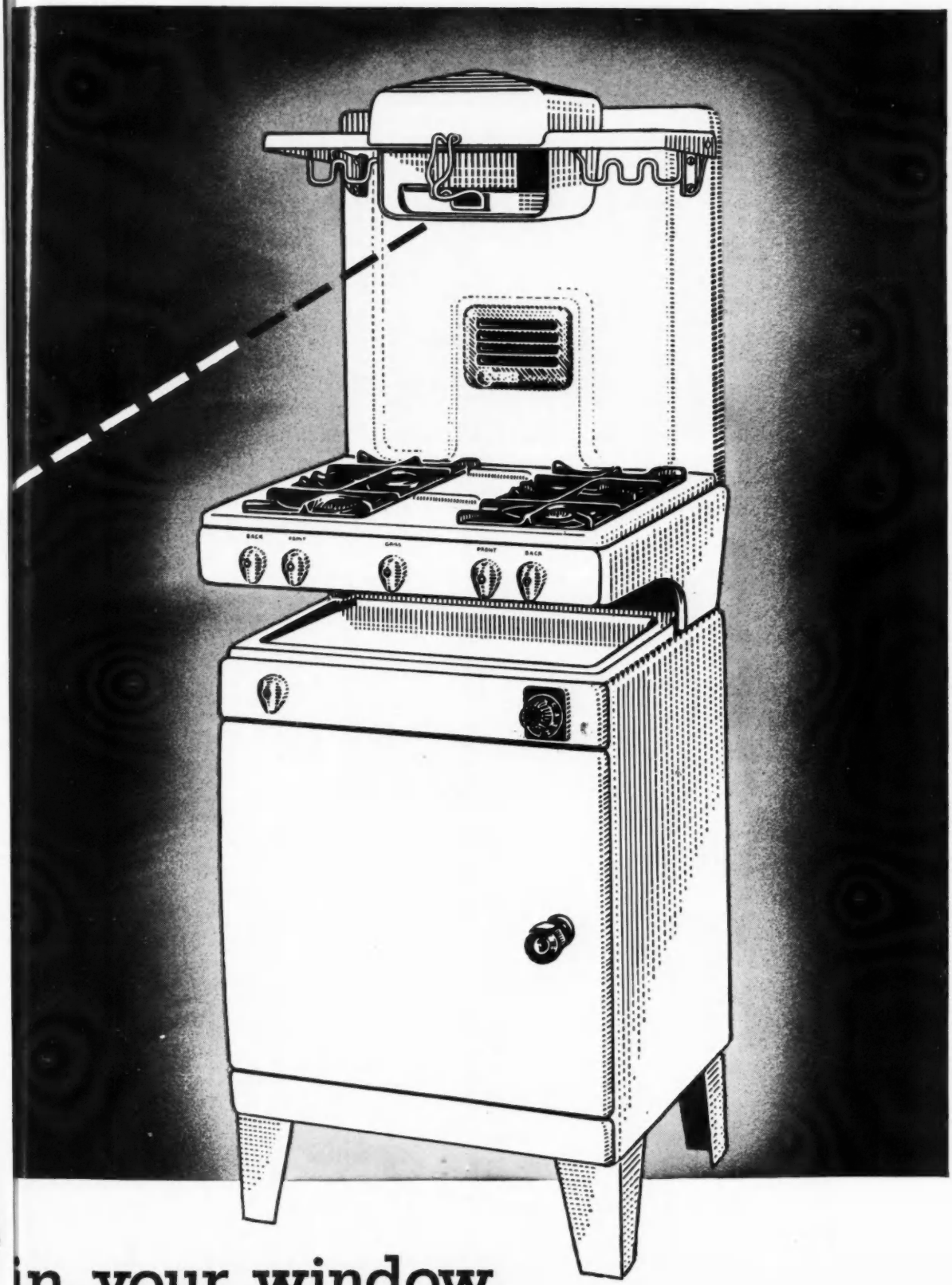

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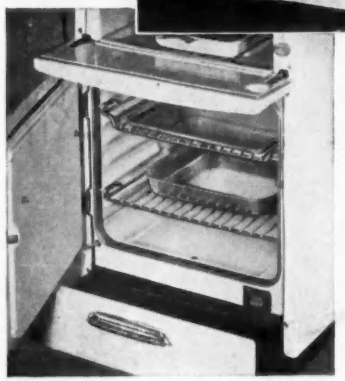
The magnificent new FLAVEL

Envoy

WOMEN COOKERY EXPERTS guided its design—that is why the magnificent new Flavel ENVOY appeals direct to the housewife visiting your showrooms. Its many practical—and exclusive—new features are there for *her* benefit, and she's quick to appreciate them. From the flush-fitting long-period timer in the modern shortsplash to the roller-bearing storage drawer at the base, the new Flavel ENVOY is superbly built in every detail, far ahead of the rest both in design and cooking efficiency . . . YET IT SELLS FOR LESS THAN ANY OTHER QUALITY COOKER ON THE MARKET.

Advertising to help your SALES. Strong national advertising will announce the ENVOY to millions of women. Stand by for the big demand !

* *Entirely new cast-iron hotplate ensures 'glide-over' pan stability.*
* *Four latest-type aluminium die-cast head burners with new 3-position control—High, Low, Off.*
* *Elliptical push-turn plastic safety taps and controls in choice of Ivory, Red, Blue, Burgundy, Brown or Black . . . at no extra cost.*
* *Grilling compartment in new 'Ice-Blue' Finish, with matching grill pan and extra large grill. Grill door styled to act as working surface when open.*
* *Superb vitreous enamel finish in Ivory or White (same price).*



Extra-large bow-front oven, in new light-reflecting 'Ice-Blue' finish, is heated by a back-burner and lit from the front—through a flash-tube on the oven base. With the exclusive BAKE/WARM control set to WARM, gas flow is less than 2 cu. ft./hr. . . . food does not dry up

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Mechanical Handling Exhibition

Many Overseas Visitors will see Equipment Destined to Play Vital Role in Automation

BUYERS from more than 50 countries will be attending the Mechanical Handling Exhibition and Convention which was opened by Sir Miles Thomas at Earls Court today. Exports of British mechanical handling equipment now total £100 mill. annually. The exhibition, which covers more than 400,000 sq. ft. and will continue until May 19, is the largest of its kind in the world. Much of the new equipment displayed will play a vital part in the automation of the future. An international convention, the first of its kind, is being run concurrently, and speakers from all over the world will discuss the latest labour-aiding devices. A full programme of industrial films has also been arranged.

The exhibition, held biennially in London, has always been rich in surprises, and this year's display is no exception. As a heavy importer of foreign goods with a relatively small, and fully employed population, Great Britain must utilize her shipping space, factories, warehouses, and raw materials, to the utmost possible advantage. Efficient handling and storage arrangements are, therefore, of urgent importance, and the exhibition reflects the stimulating effect of this urgency upon the users and manufacturers of handling equipment. For this reason apart from all others this year's exhibition is full of interest.

Extractive Plant

In plant for the extractive industries the emphasis is on automatic control and safety devices, better ways of dealing with difficult materials, the more effective separation and collection of fumes and dusts. There are new refinements of detail design in the belt conveyors and aerial ropeways and cableways for which British manufacturers are traditionally renowned.

Productivity of crawlers and tractors has been augmented by a general improvement in drawbar pull followed up by an increase in the capacity and discharge speed of scooping and digging tools. Travelling speeds are higher; lifting efficiency has been increased; trench diggers operate to greater depths; cranes have greater handling efficiency at higher levels and wider radii.

Capacity/weight ratios are noticeably improved in the plant shown this year, and so also are traction and stability. Suspension systems show interesting developments. As in other types of plant, the capacity range is wider; it includes smaller, but equally robust, tractors for the builder and public-works contractor, and massive machines with a drawbar pull in the region of 65,000 lb. or more.

Integration of the production and handling functions probably ranks with the unit-load system of handling as the most significant contemporary development in handling method, and conveyors of all types and varieties are being adapted in increasing numbers for incorporation in production and assembly lines. Concurrently, refinements of detail continue to be introduced into the traditional heavy-duty belt conveyor handling its bulk loads of difficult and not-so-difficult materials. Reduction of belt wear is a permanent aim, in furtherance of which improvements in impact idlers and the composition of belting are being effected.

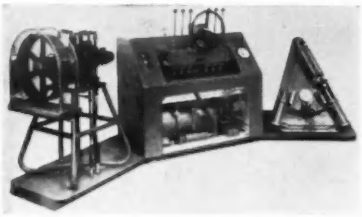
Applications of electro-hydraulic equipment continue to multiply. The equipment itself is being improved; better seals play no small part in the increased mechanical advantage that has been achieved recently in lifting and other appliances, and the development of duplex systems of valves has allowed complex synchronized movements to be obtained. The use of electrical and electronic devices to activate the hydraulic cycle has led to a prolific development of automatic and semi-automatic movements in old and new types of handling equipment. Hydraulic cylinders are being increasingly used to cushion loads and take the shock of overloads and hydraulic thrustors to transmit smooth straight-line pressure.

New uses have been found for pneumatic appliances, and electro-pneumatic devices have been applied to the tricky problem of level control in hoppers and bins.

Turning to the exhibits themselves, probably the largest stand in the exhibition, that of **George Cohen Sons & Co., Ltd.**, is devoted to this company's mobile cranes. Among these, the Jones KL33, on show for the first time, is built on the unit-construction principle and is powered by a 2-cylinder air-cooled Petter diesel. A wide choice of mountings is offered, including a pneumatic tyred chassis giving 4-wheel differential drive and 4-wheel steering. The KL 33 is the first mobile crane to be offered with this steering arrangement as a standard alternative. Thus equipped, its manoeuvrability is exceptional, the turning circle being reduced in radius to 13 ft. Apart from the KL 33 and various other of this company's cranes, the stand features photographic displays showing the various models at work on typical duties, and stressing the efficiency of the Jones Crane after sales service organization. On a second stand the company's lifting and mechanical department equipment is on show. This includes their overhead travelling crane, 'Stacatruc' fork lift truck, electric hoists, HF 'Maxilift' hydraulic floor crane, 'Handislat' portable conveyor, portable belt conveyor, heavy duty electric winch, Thompson portable 2-ton winch, gravity roller conveyor, 'Atlas' lifting trucks, hydraulic jacks, etc. Another firm exhibiting cranes was **Thomas Smith & Sons (Rodley) Limited**, who showed a 5-ton diesel locomotive crane, fitted with 35 ft. double lattice gib, which is designed for normal lifting duties and for operating a 2-line grab. Lifting magnets can be fitted for ferrous materials in bulk. The crane is self-contained and capable of operating anywhere at long periods with minimum of attention.

Marton Overloader by Mackay Industrial Equipment, Ltd.

Highlight of the **Mitchell Engineering Ltd.** display was a model of Claunie Dam, Inverness, which they are building, showing, particularly, the two overhead cableways being used to place in position the 25,000 cu. yd. of concrete which have gone into its construction. Also on show was a model of a power derrick crane manufactured by J. M. Henderson of Aberdeen, claimed to be of light construction and to weigh much less than other types, but to have the same handling capacity. A newly-designed troughed belt conveyor—a prototype which is mounted on a tubular structure—was



Part of the display by Keelavite Rotary Pumps & Motors, Ltd.

also to be seen; and a Leroy retractable mast which unrolls from a drum and can be raised vertically at 15 ft. per minute to a maximum height of 50 ft., thus dispensing with the erection of ladders and scaffolding. This company's mechanical wagon marshalling system was also on show.

Among other exhibitors of conveyors, **Spencer (Melksham) Ltd.,** have a display of photographs of work carried out by them in recent years covering the installation of conveyors, elevators, and pneumatic plants in power stations, silos, sugar plants, fertilizer plants, coal and coke handling, etc. The main exhibit is a large scale 'blown-up' photograph of conveyors at Portishead 'B' Power Station. **Richard Sutcliffe Ltd.** showed their belt and chain conveyors and ancillaries including—36 in. wide by 12 ft. 0 in. centres plate feeder; new design of belt conveyor driving head (25 h.p.) and idlers of five different designs for various duties. **W. J. Jenkins & Co., Ltd.** showed a De-Brouwer drag-bar conveyor; flight conveyor; conveyor components; composite length of gravity and lipped bucket conveyor chain with buckets; Viking Senior variable angle vibrating screen and Viking Minor fixed angle vibrating screen.

Signalling System

A full-size belt conveyor with 'Huwood' patent signalling and control system was seen in operation on the stand of **Hugh Wood & Co., Ltd.** who also showed 'Huwood' standard belt conveyor components including driving units, tension ends, patent self-lubricating oil-filled idler rollers and drums; as well as standard idler sets and transportable conveyor structures. **Crone & Taylor (Engineering) Ltd.,** displayed their portable and fixed belt conveyors, for bulk and packed materials with attachments for hand, grab, and lorry feeding. Also special hand-controlled power operated scrapers for feeding conveyors from stock piles, railway wagons, etc., and a Meteor belt thrower for stockpiling, granular materials. A mobile bagging unit for coal etc., was also featured. **Ewart Chainbelt Co., Ltd.** showed a full range of malleable iron and fabricated steel conveying and elevating chain and accessories; and medium speed transmission chains. Working models of elevators and conveyors handling materials in bulk and package were also on display.

Among the many 'live' displays the **Birtley Co., Ltd.** had a working exhibit, comprising a closed circuit of a conventional belt conveyor, and blanket-type conveyor with sampling equipment. The operation of the two conveyors demonstrates the increased angle at which material can be elevated by using a blanket conveyor. The one shown is capable of elevating material at 40° against a 16° maximum on the normal belt conveyor. This sampling equipment has been designed to meet the demand for a purely representative laboratory size sample from bulk handling systems.

Electronic Control

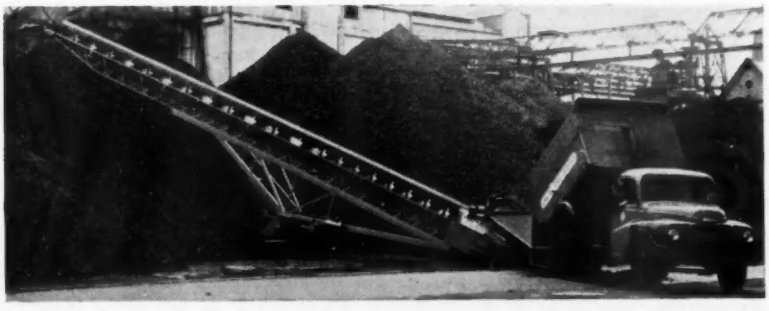
Of considerable interest was a new conveyor system, the 'Flowmaster,' equipped with electronic control developed by **Fisher & Ludlow,** in collaboration with the E.M.I. Engineering Development organization. This new conveyor can operate to a pre-determined programme, prepared and stored on punched tape, for an hour, a day, or a week ahead. The E.M.I. organization claim to have installed the first electronically controlled machine tool equipment ever to have gone into service on routine production in the factories of independent users. Visitors to the exhibition can operate the teleprinter which automatically translates instructions into the punched tape, which is then fed into the the electronic reader, which converts it into electrical impulses. The E.M.I. control unit interprets the instruction from the reader, operates the conveyor control mechanism, and checks that it has been carried out before accepting the next one. In addition, a demonstration is then given of the final link in the chain of automatic processes necessary to automation—the transfer of a component from the conveyor to and from a representation of an automatic machine; the complete cycle being automatically operated and controlled by the conveyors. Also on show is the 'Flowlink' Carousel conveyor with automatic feeding and tipping stations; 'Fisholow-Hapman' tubular en masse conveyor; 'Flowline' belt conveyors; 'Flowroll' power conveyors; and a selection of pallets, storage, boxes, etc.

C. H. Johnson (Machinery) Ltd. had a good display of dumpers and conveyors, including a 62 ft. by 24 in. Hylo-veyor, with electric drive and both power and manual jacking; and a 14 ft. Loband loader that eliminates the need for a ramp where a motor vehicle is feeding a conveyor, end-tipping trucks discharging their loads directly into the hopper of the loader. A lightweight 'LA' model conveyor was also shown, having a capacity of 90 tons per hour on material at 50 lb. per cu.ft.; while a Johnson 'Twin/55' (1E) dumper and a 2-yard dumper were also shown, the latter powered by an industrial type Petter A.V.A. 2T series 2, twin cylinder, air-cooled diesel engine. **Simon Handling Engineers Ltd.** showed their range of pneumatic handling equipment for bulk materials, including lorry-mounted pneumatic grain handling units; working plant incorporating pneumatic elevation; and fluidized conveyors for nearly-horizontal conveying of bulk material.

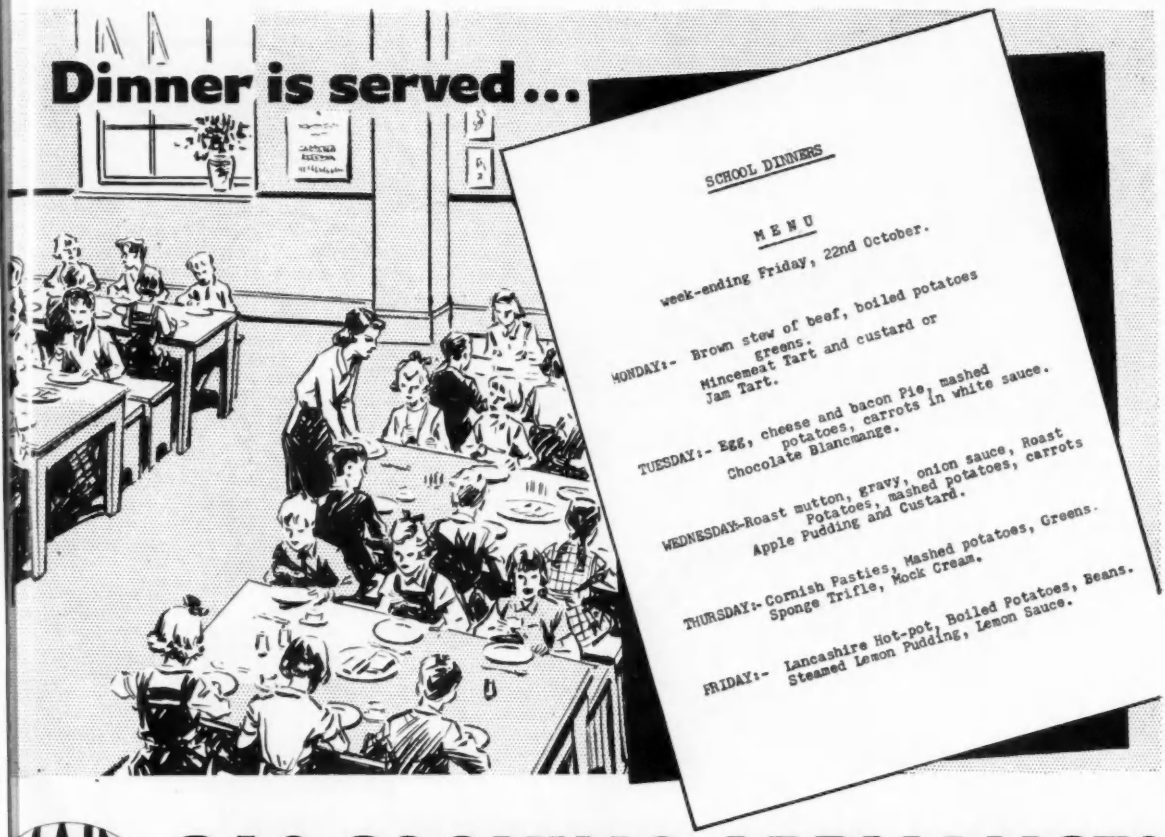
Four machines from their range of bulk materials handling equipment were exhibited by **E. Boydell & Co., Ltd.** These were the Muir-Hill 2-WL 1 cu. yd. hydraulic loader, a prime feature of which allows the machine to be tilted up to 33° from the vertical with a 25 cwt. bucket load; the smaller Muir-Hill LH-1 10.5 cu.ft. hydraulic loader, specially designed for working in confined spaces; the Muir-Hill shunter, which has the capacity for moving 180 tons of loaded railway stock; and the Muir-Hill 10B 3 cu. yd. gravity-tipping dumper with patent rotating seat and steering. **W. E. Bray & Co. Ltd.** showed the 'Hydra-loader,' a hydraulic front-end loading shovel, and the 'Dualoader, hydraulic combined front-end and overhead loading shovel, both of which were shown with complete range of attachments for snowploughs, bulldozer blades, forklifts, hoists, cranes, ditchers, mowers, etc.

Faster Stockpiling

The **Chaseside Engineering Co. Ltd.,** showed the Loadmaster '600' (front wheel drive loading shovel), which gives faster stockpiling on firm ground and is intended for handling bulk materials on industrial premises and in confined areas. The new fork lift attachment, lifting 3,000 lb. at 24 in. centres to a maximum height of 10 ft., was also on show for the first time. This unit is interchangeable with any of the scoops and makes the Loadmaster '600' a multi-purpose machine to all industrial users. Another exhibit, the loadmaster '500' (rear wheel drive loading shovel) is fitted with the latest style power-assisted steering to eliminate operative fatigue. A number of new attachments were on view for the first time, including a 7 ft. 6 in. bulldozer blade and a 1 ton crane hook, both of which can be attached to the scoop of the Loadmaster in a matter of



C. H. Johnson (Machinery) Ltd., Hylo-veyor and Loband loader.

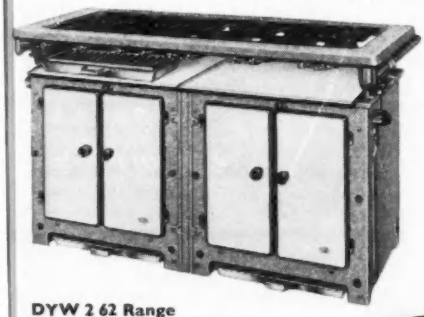

Dinner is served...
SCHOOL DINNERS
MENU
week-ending Friday, 22nd October.
MONDAY:- Brown stew of beef, boiled potatoes greens.
Mincemeat Tart and custard or Jam Tart.
TUESDAY:- Egg, cheese and bacon Pie, mashed potatoes, carrots in white sauce.
Chocolate Blancmange.
WEDNESDAY-Roast mutton, gravy, onion sauce, Roast Potatoes, mashed potatoes, carrots
Apple Pudding and Custard.
THURSDAY:- Cornish Pasties, Mashed potatoes, Greens.
Sponge Trifle, Mock Cream.
FRIDAY:- Lancashire Hot-pot, Boiled Potatoes, Beans.
Steamed Lemon Pudding, Lemon Sauce.

MAIN

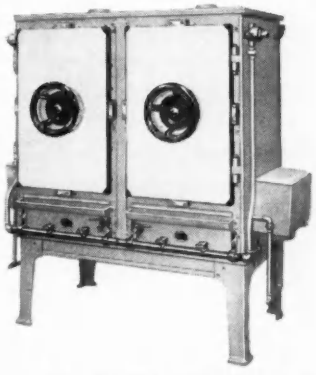
GAS COOKING APPLIANCES

are used in schools throughout the country

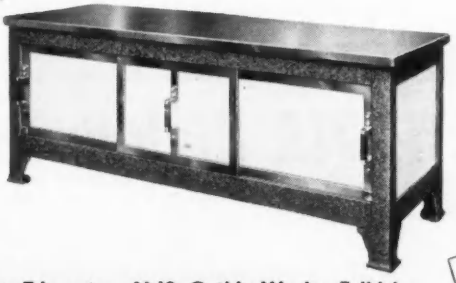
The extensive range of Main large-scale cooking appliances cover the specific requirements of every type of catering establishment. Highly efficient in use and economical on gas consumption, Main appliances are strongly constructed to withstand continuous heavy usage . . . When it's a question of kitchen equipment, consult R. & A. Main Ltd.



DYW 2 62 Range
Two ovens, each with automatic heat control. Hotplate has 10 boiling burners or can be fitted with a combination of boiling and grill burners.



Gas Heated Steaming Oven
Available as Single or Double Compartment Batteries, each Oven heated by independently controlled aerated gas burners. No. 1824 Series has 7½ cu. ft. compartment fitted with 6 trays. No. 182424 Series has 6 cu. ft. compartment with 5 trays.



GHC/L Hot Closet
In lengths from 3' to 10' fitted with two shelves and sliding doors (one or both sides). The top either plain or incorporating Bain Marie with or without food containers.

Note the name - made by MAIN

R. & A. MAIN LTD., Gothic Works, Edmonton, N.18, Gothic Works, Falkirk

Aromatics are to your car what seven-league boots were to the Giant . . .

Aromatics are the things in a motor spirit that have extra built-in miles to the gallon . . .

Aromatics are what National Benzole Mixture has twice as much of

NATIONAL BENZOLE high-aromatic MIXTUR

THE MOST MODERN OF ALL MOTOR SPIRITS

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seconds. A special rock scoop for quarry work, mining, and other jobs requiring load selection is designed to pick out only the wanted material.

Eimco (Great Britain) Ltd., had a display of heavy duty overhead loading equipment, and special purpose 'off-the-road' load carrying vehicles, including an electric version of the normally air-operated crawler mounted overhead loader; heavy duty dumper; diesel-powered overhead loader; compressed air operated rail-mounted loader. There was also the Model 621 Loader, suitable for handling bulk cargoes from ships, which can also be fitted with bucket loading attachment or hopper. The base of this machine can be used as a machinery carrier. On the stand of **Strachan & Henshaw Ltd.,** a full-size Rotaside Wagon Tippler was seen handling a British Railways 24½ ton capacity mineral wagon. Also displayed were other types of wagon tippler, 'angle,' skip hoists and 'beetle' wagon marshalling equipment.

Turning Eliminated

Mackay Industrial Equipment, Ltd., showed a Merton overloader. The ¼ cu. yd. capacity bucket of this machine covers the full width of the front wheels and is hoisted by cables up a pair of overhead rails to be discharged over the rear at a height variable from 6 ft. 11 in. to 11 ft. 2 in. It is powered by the Fordson Major diesel engine and the drive to the winches which control the bucket is taken from the front of the engine crankshaft. Full control of the bucket is therefore retained at all times, even when changing gear. Being an overhead loader all turning and slewing between stockpile and lorry is eliminated and extremely fast loading is easily obtainable. **Ransomes Sims & Jefferies, Ltd.,** showed a comprehensive range of battery-powered fork lift, and platform trucks and tractors.

Keelavite Rotary Pumps & Motors Ltd. illustrated the many advantages of hydraulic drive and control by making their exhibit a working demonstration assembled from standard units. The demonstration was in two parts, one a variable speed reversible hydraulic rotary drive and the other an application of hydraulic cylinders, the whole arrangement being powered by a variable capacity rotary abutment pump and controlled from a multiple valve block. Units from the company's range of products used in the hydraulic transmission of power were also shown, of particular interest being the series of gear type units which can be used as reversible hydraulic pumps or motors without modification. Double acting cylinders were also shown in a variety of bore sizes and mounting styles, while among valve gear exhibited were single and banked direction controls with various methods of actuation and also a range of pressure and flow control valves for direct or pilot operation.

A number of new and improved products were included in the display by the **British Tyre & Rubber Co., Ltd.** In addition to a wide selection of standard types of conveyor belting, there was a range of new hot material belts, a solid-woven coalface conveyor belt of exceptional strength and flexibility that does not narrow in service, and two new grades of a special coalface belting made in multi-ply construction. Also shown was a new heavy-duty impact idler incorporating rubber-in-shear. Hoses of all types for the widest industrial service were displayed as well as a new quick-fitting twin-clamp coupling designed for use in conjunction with BTR Fulflex hose, and giving an absolutely leak-tight fitting. A new synthetic fibre reinforced plastic hose of exceptional strength was also exhibited. Called Plastidry, this hose consists of a P.V.C. cover and lining fused onto a synthetic reinforcing fabric to form a plastic mass of outstanding toughness and wear resistance. It is unaffected by damp or sunlight; immune to rodent, insect or fungus attack; and cannot be harmed by direct contact with oils, acids and alkalis. Other new hoses exhibited for the first time included long-length spray hoses in high pressure construction; high pressure wire braided hose units, in both fixed and adaptable end-fitting types, and BTR oil suction and discharge hose —a tough and flexible heavy duty hose for petrol and petroleum products. There was also a comprehensive display of the company's range of high test V-belts and flat transmission belting, and other interesting exhibits including Pluvicor air ducting (a durable and flexible ducting for the auxiliary ventilation of mines featuring a patented leakproof and resilient jointing which requires no mechanical accessories for assembly), Pluvicor brattice cloth, and BTR vibro-insulators.

Specially Designed

The **Silvertown Rubber Co., Ltd.,** showed their range of products covering every need in the industrial application of natural and synthetic rubber, ebonite, gutta percha and certain plastics. Among the display of conveyor and elevator belting were examples of Silvertown heat-resistant, fire-resistant, fire-resistant—coal face, and fire resitant—heavy duty and wire kinds. Long-length moulded and braided and mandrel-built wrapped industrial hoses of every type were also exhibited, for the efficient, economical conveyance of air, water, oil, chemicals, steam, wet sand and gravel, etc., each specially designed for the job and all built to exacting standards. These included the Silvertown oil hose of the type supplied to the Esso refinery at Fawley. This hose is reinforced with steel wire embedded in the rubber and canvas walls, and is further protected by external metal armouring connected to the flanges for the safe dissipation of static. The Silvertown system of plant protection was demonstrated with a typical working installation of ebonite-lined tanks coupled with an ebonite centrifugal pump, pipelines and fittings. This feature was in continuous operation and demonstrated the ease in which corrosives can be handled. In addition various rubber and ebonite-lined components were displayed covering applications in all manner of industries. Silvertown gutta percha ebonite, and Leclanché Cells were also represented.

Industrial rubber products were also displayed by the **Goodyear Tyre & Rubber Co. (Gt. Britain) Ltd.** These included conveyor belting; special type hose for conducting materials; V belt; a new endless type of transmission belting of exceptional power rating; and dock fenders for dock and industrial applications. **Griflex Products, Ltd.,** showed Bardex patent reinforced PVC hose, which is claimed to be ideal for low-pressure or vacuum pipes, conduit, etc., and is supplied in sizes from ⅜ in. to 1 in. bore diameter. It cannot kink, and a sight of the conveyant through the pipe can be constantly maintained. This hose is a revolutionary development in the plastics field and has an incredibly wide application. The **Dunlop Rubber Co. Ltd,** showed their conveyor, transmission and elevator belting for general industrial use. Also fire resistant Extron belting for the mining industry, including new 2-ply Extron p.v.c. belt for use on gate and face conveyors. Flexible pipes for high, medium and low pressure hydraulic or pneumatic services, and containers (bins, buckets, trays, etc.) made from Fortiflex, a rubber resin compound combining the advantages of toughness, lightness, and resilience.

Fluidrive Engineering Co., Ltd., had a display of dual fluidrive—exhibited for the first time—a two-circuit Vulcan-Sinclair flued coupling for use in reversing drives, such as winches and haulages. Other working models included a flywheel set demonstrating the characteristics of traction type fluid coupling when driven by squirrel-cage motor, and a pony brake set showing features of scoop-control fluid coupling.

A.C.E. Machinery, Ltd., were showing electricallly operated capstan winch, a vehicle power take-off winch; a de-breezing screen; passenger/goods hoist; skip hoist winch; logging winch; power operated hand scraper; as well as midget hoists and vibrators.

Anti-Collision Gear

Robert Cort & Son, Ltd., displayed their resonance free-oscillating horizontal screen, single deck, 1,400 mm. wide by 3,500 mm. long. **The General Electric Co., Ltd.,** put on a good display which included 'Sherwen' electro-magnet vibratory screens and feeders; heavy duty idlers; also a model of 'Vibrex' screen and wagon marshalling gear. **British Thomson-Houston Co., Ltd.,** also showed electric equipment, including motors from fractional horsepower sizes to 25 h.p., many in operation, together with BTH direct-on-line starters. There was also a control console and contactor panel for Ruston-Bucyrus 3½ cu. yd. all-electric shovel dragline, and a model electric o/h travelling crane fitted with new automatic anti-collision protection equipment.

The Rawlplug Co., Ltd., displayed their rawlplugs for screw fixings; rawl-belts for heavy bolt fixings without grouting in; white bronze plugs, screw anchors and belt anchors for fixings in wet or humid situations; special fixings for thin or cavity materials; and masonry boring tools for hand, electric, or air power operation.

Influence of Competition

by **WILLIAM C. CAMPBELL,** District Manager, Paisley

An abstract from the Presidential Address to the Scottish Association of Gas Managers

DURING the past year or so, competition between the fuel and power industries has become more intense. In this period, the competitive position of these industries has altered rather to the disadvantage of gas.

It is unfortunate that the National Coal Board deems it expedient to charge coal supplied to the gas industry at a higher price than to any other class of consumer. Undoubtedly this factor, more than any other, tends to weaken the competitive position of gas as a fuel, and, as the gas industry makes the best use of the nation's coal, the Coal Board should rather encourage the expansion of the gas industry. It is evident, if industrial productivity is to be maintained, far less increased, that there will be difficulties with coal supplies for a long time to come. Unfortunately, the Coal Board has experienced great trouble in making its financial ends meet, and this has been further aggravated by the fact that it has to finance the cost of imported coal, which is estimated to amount to 11 mill. tons in 1955, creating a loss of between £30-£35 mill. There is nothing meantime to foster a hope that these losses will be recovered in any other way than by increasing the cost of coal. The alternative, greater production, is hindered by shortage of underground labour in the mines, although there are people who consider that greater production is possible from the existing labour force providing miners will cease to think of 'the wrongs of the past.'

Coal will get dearer and scarcer if industrial productivity is to increase, because greater production requires more power and the atomic age is not yet with us. There are those who advocate the setting up of a 'free market' in coal, thus removing the burden presently carried by the Coal Board of financing imported coal. Such an arrangement, creating as it would a scramble for the better qualities and special kinds of coal, with rise in prices, resulting as a direct consequence, cannot be viewed by the gas industry with equanimity, but I do not suggest that we are entitled to be satisfied with the operations of the 'controlled market' in existence now, where the consumer has little say in the quality and price of the coal directed to him.

Electricity Tariffs

The main competition, and the most serious to the expansion of gas sales, comes from the electricity industry. The average price of electricity increased by only 30% between the years 1937-38 and 1954-55. Indeed, the cost of electricity to domestic consumers has actually fallen in that period. It is true, however, that there was a further increase in the summer of 1955 to offset the rise in cost of coal at that time, but there is no doubt that the electricity industry has established a strong position in the domestic field. Admittedly this has been achieved by increasing the cost of electricity to industrial and commercial consumers to a greater extent than to other classes of consumers, but the greatest assistance has come from the substantial annual increase in sales. The increase in electricity sales amounts to about 10% per annum and it is upon this foundation that the tariff structure of the electricity industry is built.

Consumption of electricity per domestic consumer rose substantially during the immediate post-war years, but in common with gas consumption, has tended to decline in recent years. The severe weather experienced throughout the country during the winter 1954-55 reversed this tendency, if only for the time being, but it appears unlikely, apart from exceptional circumstances, that this reducing rate of consumption per domestic consumer will be arrested.

It is unfortunate for the gas industry in Scotland, and elsewhere, that although electricity is sold to domestic consumers at about 1.5d. per unit on the average, we require to compete against a commodity rate of 1d. per unit. The electricity industry must obtain a revenue of approximately 1.5d. for every unit sold to the domestic consumer in order to balance income with expenditure. On the basis of this average price, an electric fire should cost 3s. 8¼d. per useful therm and be the dearest way of heating a room—besides being the most wasteful of the nation's coal. This shows the effect of the two-part tariff in disguising the real price of the commodity so that gas has to withstand competition from a unit sold at two-thirds of its true cost.

Reduction in Gas Consumption

Nothing is more disheartening to the gas manager and to the gas salesman than instability of gas prices. The lack of stable prices is a factor unfavourable to the promotion of increased gas sales, but as the price of gas is closely related to the cost of coal and labour, the immediate outlook is not reassuring. In the last few years, consumption of gas per domestic consumer has shown an inclination to decline. This may be due in some measure to the increasing efficiency of modern gas appliances, which are being installed at a remarkably high rate. Nearly 357,000 modern gas cookers have been installed in Scotland in the last five years, mostly to replace old and less efficient types, and assuming an annual average consumption of gas for cooking for an average household to be 80 therms, the saving to our consumers in this direction alone may be estimated as equivalent to 10 mill. therms per annum.

Increasing supplies of hot water for household purposes are being provided now from properly designed and efficient gas-fired sink water heaters, of which in the last five years some 35,000 have been installed in Scotland. Previously, the housewife was content to heat water for this duty on the gas cooker. An investigation has indicated that in very many cases the installation of the sink water heater does not cause gas consumption to rise and often to fall slightly—a tribute to the efficiency and convenience of these appliances. It has been accepted that the gas industry seeks to supply a 'heat service' rather than a refined fuel, and as a result, must provide suitable appliances as part of this service. The cost to the consumer is split into two parts: (1) For the heat consumed and (2) for the supply and subsequent maintenance of the appliance through which the heat is directed to useful service. It may be necessary for us in the future to pay more attention to our revenue per domestic consumer from both sources when attempting to assess our competitive position and our standing in the eyes of the public.

National ownership of our industry has given a tremendous fillip to sales promotion by making available the capital necessary to finance schemes designed to promote gas appliance sales and an improved standard of service to our domestic consumers.

Charging for Gas

I am far from being alone in the opinion that the gas industry has suffered in competing with electricity and solid fuel through unwillingness to apply tariffs comparable in design with those operated successfully by the electricity industry or capable of competing on a basis of running costs with coal for space heating or full scale water heating. Thirty years ago, Mr. James Campbell of Dunfermline, in a paper to this Association, pointed out that it was generally accepted that 'the flat-rate charge does not distribute costs equally among consumers, as by this method many are served below the actual cost of supplying them while others are paying an undue share for carrying on the undertaking.

Fifteen years later, Mr. A. F. Pollock, of Edinburgh, said in a paper: 'The need for promotional tariffs to improve the

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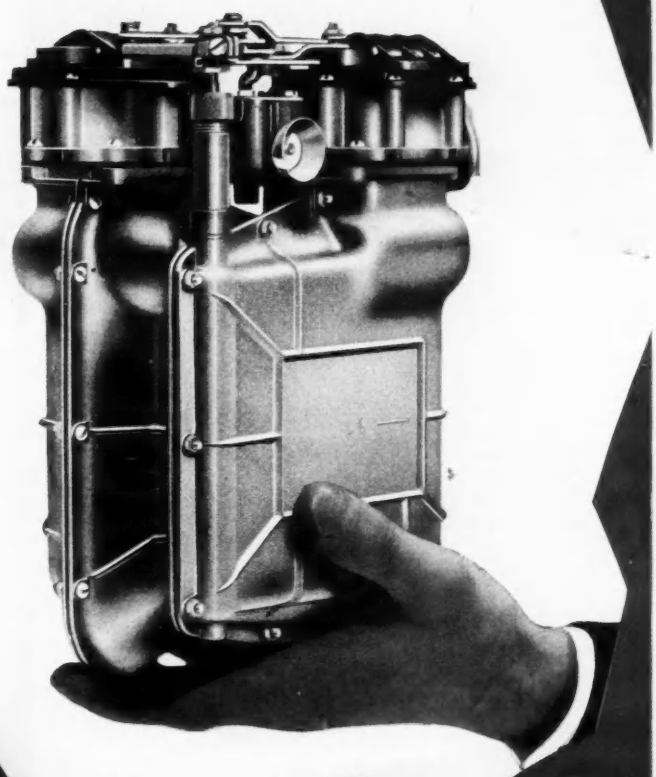

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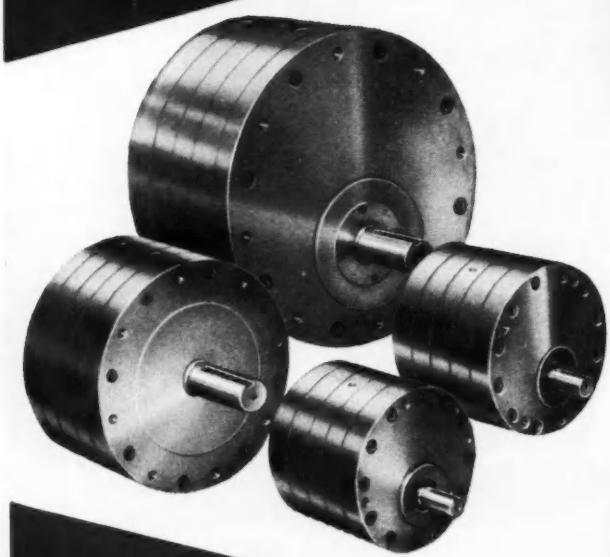

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competitive position of gas in relation to other fuels was becoming more and more widely recognized in the gas industry in the inter-war years. But practice lagged behind theory, and most gas undertakings were hesitant about making fundamental changes in their price structure. This hesitation rose partly from differences of opinion as to the best form of promotional tariff, but mainly on account of the statutory provisions, affecting the methods of charging for gas, which make it illegal to levy a compulsory minimum service charge on all consumers. Were this restriction removed, it is perhaps a reasonable assumption that the two-part tariff would, within a short space of time, become the standard method of charging for domestic gas throughout the country.'

The fetters of antiquated legislation were broken in May 1949 and in the last seven years adequate production plant has been made available in Scotland. It has been a source of encouragement to the members of this Association that our Board in 1954 took the first step along the path which may lead in due course to the operation of promotional tariffs throughout Scotland. Early in that year, the Board substituted for the many and varied methods of charging for gas, a simple five block scale applicable to all classes of consumers. The domestic consumer of electricity is required to pay for supplies on a two-part tariff cum two block scale.

Appreciating that consumption of electricity in the initial block is for lighting purposes, gas is required to compete for the purpose of heat transfer with the promotional rate for electricity at 1d. per unit, equal to 2s. 6d. per therm. If we were prepared to charge domestic consumers in the Paisley area only 4s. per therm for the first five therms, additional consumption could be made available at 1s. 3d. per therm—a highly competitive figure. Such an initial charge would be sound in principle and justifiable in the case of the 'small' consumer, but might be politically inadvisable because of the effect on the 'poor' consumer. Nevertheless, I favour the system of imposing an adequate standing charge but, as an alternative, see hope for the introduction throughout Scotland of a simplified two block scale applicable to domestic consumers only and possessing a differential of at least 6d. per therm.

Units of Charge

A need exists for closer relationship between the bases of charge for gas and electricity. The therm of 100,000 B.Th.U.s is too large in comparison with the B.O.T. unit of 3,412 B.Th.U.s. In the same way, a ton of coal cannot readily be compared with a gallon of oil. An increase of 0.1d. per unit of electricity is equivalent to an increase of about 3d. per therm, while an increase of 1d. per gallon of petroleum products can mean as much as £1 per ton. It has appeared to me always that the gas industry has the power to adopt as a basic unit of charge a quantity of 10 cu.ft., and while it would be greatly to our advantage to have a gas unit of uniform thermal value, numerous difficulties stand in the way. The supply of a standard calorific value throughout the country would provide the solution, and it may be that in the not too distant future this major problem will require to be faced. A 10 cu.ft. unit of gas of 450 B.Th.U.s at 20 pence per therm, would have a selling price per unit of 9d. Similarly, gas of 400 B.Th.U.s at 20 pence per therm would have a selling price per unit of 8d.

In order to fulfill statutory obligations it would be necessary only to publish the price per unit of gas, the number of units in a therm, the price per therm and the declared calorific value. With these particulars on each account, the consumption would be expressed in units of 10 cu. ft. Thus we would have a gas unit of 4,500 B.Th.U.s and 4,000 B.Th.U.s, costing 9d. or 8d. per unit respectively against the electrical unit of 3,412 B.Th.U.s costing 1d. on the second part of the electricity tariff. The gas unit would be bigger and cheaper than the electrical unit and the fact could be used with effect in our sales approaches. The combination of the gas unit and a promotional gas tariff may create a powerful selling aid for gas.

In the past, production of the cheapest therm of gas has been related to calorific value and the coal-coke ratio of prices, and with all other relevant factors being equal, this remains so to-day.

If a uniform quality of gas of 450 B.Th.U.s was established in Scotland, approximately 60-70,000 tons of coal would be required as an addition to the 2.4 mill. tons carbonized in 1954-55. Some 30-40,000 tons of coke would be placed on a market capable of absorbing even larger additional quantities. The thermal capacity of production plant and the carrying capacity of distribution networks would increase in those places where the gas quality had been raised. If, however, a uniform calorific value of 425 B.Th.U.s was selected, some 90,000 tons of coal less would be used, with consequent reduction in the tonnage of coke available for sale. Dwindling coal supplies of suitable coking types make it very unlikely that consideration can be kiven in Scotland to the supply of a quality in excess of 450 B.Th.U.s. The relatively high cost of continuous vertical retort plant has diminished one of the advantages claimed for the system in the past—that of being able to produce economically low quality gas from suitable coals in a 'single stage' process. Present thought favours high thermal yields of straight coal gas of high calorific value and the separate production of diluent gases in water gas or complete gasification plants and is claimed to produce the cheapest therm and great flexibility of output. The rate at which the price of coal, coke, plant and labour are rising would seem to merit the setting up by the Scottish Gas Board of a special investigation of all these complex matters, so far as they pertain to Scottish coals and conditions.

It is apparent from a study of figures that the small unit of gas production plant cannot be operated nowadays to produce a balanced budget, especially in the isolated places in Scotland. It cannot be denied that the prestige of the whole gas industry in Scotland is closely bound up with the fate of these small undertakings and that our Board adopted the right attitude to the problem—immediate raising of the standard of service and supply in these districts despite the cost involved. This policy had much to commend it as a short term expedient, having regard to the conditions prevailing in 1949. A great deal of effort, freely given by all concerned, and such capital as was available, was used to raise these units to the highest possible efficiency, and give gas consumers in these districts a better service than they had enjoyed, in many cases, for the previous quarter of a century. Authority was given to proceed with schemes of connecting by pipe lines those small places which lay adjacent to larger districts. Thus some 29 units of production have ceased to operate and the burden of maintaining the small units lightened.

TOTAL LOSSES INCURRED IN UNDERTAKINGS OF LESS THAN 50 MILL. PER ANNUM PER 1,000 CU. FT. MADE

Groups of Undertakings Making	Total loss incurred		
	Average of three years £	Equivalent to pence per 1,000 cu. ft.	
		Made by Undertaking	Made by Board
(I) Under 5 mill. cu. ft. ..	11,504	179.6	0.05
(II) 5-9 mill. cu. ft.	17,303	69.2	0.09
(III) 10-29 mill. cu. ft.	103,443	35.9	0.52
(IV) 30-49 mill. cu. ft.	71,258	18.0	0.36
	£203,508		1.02

(1) Gas made in 1954-55 by undertakings under 50 mill. cu.ft. per annum—1,714 mill.

(2) Gas made in 1954-55 by Board as a whole—47,709 mill.

It is apparent that but for nationalisation a substantial number of the very small undertakings would probably have succumbed to economic pressure. The present subsidy may not appear of great consequence when reduced to terms of gas made throughout Scotland, but a longer view must be taken. Consolidation of production into larger units is the answer to the problem in certain parts of Scotland, and we must be prepared to consider schemes of integration on the grand scale and as a matter of considerable urgency. The recent imposition of capital restriction will be regarded as a temporary deterrent to reducing as rapidly as practical the number of small production units. Where integration seems uneconomic, substitution of coal gas with butane plants should be considered. As a last resort, the provision of 'bottled gas' may be the solution in some cases. When examining these matters, regard will be had to the amount of capital which could be furnished by the amount of anticipated losses on revenue account due to the continuing existence of these small units.

WHITHER TARIFFS?*

By A. F. Pollock,
M.A., B.COM., C.A.

EDINBURGH, SCOTTISH GAS BOARD.

BEFORE the gas industry was nationalised each undertaking was free to determine its own method of charging for gas. The methods employed would doubtless reflect the views and opinions of individual managers, boards and local government committees, and these views and opinions would be influenced by local conditions. It is not surprising, therefore, that the Scottish Gas Board in taking over nearly 200 separate undertakings inherited a great variety of tariffs. No doubt many of these tariffs, viewed against the local background, had a good deal to commend them. But with the transfer of an industry to a single owner, especially where the owner is a State board, there comes—inevitably, it seems—an insistent demand for uniformity.

The Board then had to set about the task of reducing chaos to order, bearing in mind the injunctions of the Gas Act to balance their accounts one year with another and to show no undue preference. Preliminary consideration of the problem led to three main policy decisions. The first was that while there should be a uniform tariff structure, the price would not be the same everywhere, but would be related to local cost, subject only to there being a maximum or 'ceiling' price which would not be exceeded anywhere whatever the local cost. The second policy decision was that the tariff structure should take the form of a block tariff with the same blocks of consumption for all undertakings but with different prices in conformity with the first policy decision. The block tariff was selected in preference to other forms because it was already in fairly general use, was understood by the public and was reasonably simple to administer. In the third place it was decided that the tariff should apply to all consumers irrespective of the purposes for which gas was used except that prepayment consumers would pay a penny per therm extra on the first block of consumption. Certain other relatively minor regulations were later decided upon relating to *inter alia* meter rents, aggregation and continuance of certain existing rates.

Block Sizes

The broad principles of a uniform tariff structure having been laid down, the next steps were to determine the blocks, the price differentials between them, the number of separate price tariffs, their overall range and the price intervals between each. The determination of the block sizes was rendered difficult by the lack of statistical information about the consumption characteristics of the different classes of consumer. Average consumptions for domestic, commercial and industrial consumers were available, but averages are not very helpful. The average domestic consumption was about 110 therms per annum and it seemed reasonable that the first block should be related to this figure. It was therefore fixed at 27 therms per quarter. The second block was fixed at 600 therms having in mind the larger domestic and smaller commercial consumers, the third at 600 for the larger commercial and small industrial consumer; the fourth block of 15,000 therms and the fifth block for all consumption in excess of the first four are mainly of interest to the large industrial consumers.

The gap between the average holder cost and the average cost of gas for the whole Board was of the order of 5d. per therm. It was therefore decided that this would be the basic overall difference between the highest and lowest prices of each tariff. This difference was spread over five blocks to give a drop of 2d. per therm in the second block and a further 1d. in each of the remaining three. A later decision made the difference progressively wider for the tariffs in the higher price ranges so that at the dearest tariff of all the gap became as much as 8d. per therm. This was done primarily to assist the smaller undertakings with high price levels where it was thought that a very sharp drop in price from the first to the second block of the tariff would encourage higher consumption per consumer and thereby improve the financial position. The latest price adjustment at July 1955 has still further widened the gap, so that the difference now ranges from 6d. in the cheapest tariffs to 9½d. per therm in the dearest.

The underlying theory of the block tariff is that the price of the first block should be at a high level in order to recover even from the small consumer those overhead charges which are fairly constant for all consumers irrespective of the amount of gas used. Thereafter there should be a steep drop to the second block of consumption and a more gradual tapering of the price towards the larger blocks until in the largest block the price approaches the cost of production only.

Ceiling Tariff

In determining the range and number of tariffs it seemed desirable to fix the highest or ceiling tariff at a level which had some regard to the price of competitive fuels, particularly electricity, and a figure of 26d. per therm as the price of the first block of the dearest tariff was decided upon. (It has since been necessary to raise it to 30d.) At the other end of the scale the lowest price tariff was determined by the costs of the lowest cost undertakings. This proved to be a tariff with a price of 15d. per therm for the first block. Corresponding tariffs expressed in terms of thousands of cubic feet were calculated for those undertakings having no declared calorific value. The calculations were related to a calorific value of 400 B.Th.U. per cu.ft., so that the difference between each tariff was 4d. per 1,000 cu.ft.

There were thus created 24 tariffs, 12 for thermal and 12 for non-thermal undertakings (since changed to 13 and 11 respectively), and the next and perhaps the most laborious task was to determine the tariff which would enable each undertaking to balance its accounts. To do this it was essential to know with reasonable accuracy the total consumption within each block of the tariff; for, once this was known, the revenue from any one of the tariffs could be readily found by multiplying the blocks of total consumption by the appropriate block prices. It was thought that this information could be most economically obtained by a process of sampling. A sampling method was therefore devised and circulated to all group and divisional officers with a request that they should apply it to each undertaking and select for each the lowest tariff which would yield a profit. The resulting recommendations, after some adjustment by the Board and following approval by the Gas Consultative Council, were put into effect on April 1, 1954. It was estimated from the returns received that the increase in revenue arising from the application of the standard tariffs would be about 1¼d. per therm. For the first year of their operation the increased yield was 1.15d. per therm. Considering the fundamental nature of the change from a great variety of tariffs to a uniform method of charge, these results were a tribute not only to the efficacy of the sampling method but to the care and accuracy with which the work was done by group and district staffs.

By the time this paper is presented the standard tariffs, with adjustments for rising costs, will have been in operation for two years. We have seen that in the first year they achieved one of their main purposes of balancing the revenue with the expenditure. The time seems now to be opportune to consider in the light of experience whether they have been as satisfactory in other directions. If the only purpose of a tariff were to

* *Presented at the Spring Meeting of the Scottish Association of Gas Managers.*

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balance the accounts a flat rate per therm would achieve this object with the minimum of administrative trouble and expense. But the flat rate as the sole method of charge has long been abandoned in favour of tariffs designed to meet competition, to encourage the greater use of gas and to secure greater equity as between one consumer and another.

Daily Contact

District managers and their staffs have an advantage over the Board and their head office officials in that they are in daily contact with their consumers and are in a better position to assess the effects of Board policies. The knowledge and experience so gained by district staffs, if put at the disposal of the Board, can and should play a major part in the formation of future tariff policy. But remote as we sometimes feel at headquarters, we do receive representations, direct and indirect, which show how the wind is blowing. On the strength of these and of certain convictions of much earlier date I propose to make certain suggestions which might improve the tariffs both administratively and commercially. These are quite personal views, but you might agree with some and you will, I hope, be provoked by others into putting forward even better ones.

First, then, let us look at the tariffs from the administrative angle. In that respect one complaint has been that they lack flexibility in fitting the tariff to the needs and costs of individual undertakings, both initially and when price adjustments become necessary. This is because the price gap between tariffs is fixed at 1d. a therm so that individual district price adjustments must be by a full penny up or down; there is no half-way house, even although a change of ½d. or ½d. either way might achieve the correct balance of revenue and expenditure. To remedy this—and incidentally make it easier to have a single standard gas bill for all districts in a group—I suggest that, for this kind of tariff, it might be sufficient to have only two standard tariffs, one for undertakings with a declared calorific value and one for those without, and express the price at any particular undertaking as the standard tariff plus or minus 1d., 2½d., 3½d., or any fraction that happens to fit the case.

Commercial Aspect

Turning to the commercial aspect, we are not infrequently told that the price of gas has risen too much. The price has indeed had to be increased steeply in the last few years and the principal reason for this has been the sharp rise in the price of coal, which is now between four and five times the pre-war price. As against this, and thanks mainly to the higher revenues from residuals, gas is only about three times the pre-war price, which is very much in line with the rise in the general level of prices since 1939. On the other hand, for reasons which I think are in no way connected with the relative efficiencies of the respective industries, the prices of electricity and oil have not risen so much and the gas industry is therefore meeting a greater degree of competition from these fuels. In consequence the rapid expansion of the industry which occurred in the ten years from 1939 has slowed down and in Scotland as a whole gas output has been almost static since vesting date.

Any fall below the present level of output would aggravate the situation because the same capital charges and overheads would have to be spread over fewer therms and the price per therm would go up. The converse is not necessarily true to the same extent; much would depend upon whether increased demand could be met from existing plant, and this in turn would depend upon the location and load characteristics of the new demands. Tariffs should therefore be designed as far as possible to retain existing business and to attract new business of the right kinds in the right places, from which it follows, for example, that it might be profitable to sell marginal gas below the present commodity cost in districts having considerable surplus plant capacity.

What we have to consider is whether the present tariffs achieve these objects, and if not what changes are desirable and practicable. But let it not be forgotten that we must balance our accounts and that price concessions in one direction will have to be made up by increased revenue in others. It would be preferable and to be expected that some of the increased revenue would come from increased sales, but the higher sales might take time to develop and in the interval the Board might suffer loss. Looked at purely from the financial angle it would therefore be desirable to find some immediate source of additional revenue which would tide us over the development period.

An analysis of the Board's accounts by the methods recommended in the Report of the Committee on Gas Charges appointed by the National Gas Council in the 1920's—and so far as I am aware, the only official pronouncement on the subject—shows that the commodity cost in 1954-55 was 13.03d. per therm and the average service cost was £2 14s. 9d. per consumer. The corresponding figures for 1956-57 are estimated at 14d. per therm and £3 10s. respectively. These are, of course, Board averages and will vary from district to district. To illustrate my points I shall use the corresponding figures for the district of which your President is manager, namely Paisley. For that district the figures are:—service charge, £3 14s.; commodity charge, 1s. per therm. This means that if each consumer in Paisley paid 18s. 6d. a quarter he could get all his gas for 1s. a therm. It is not to be supposed, however, that the same service charge would be payable by every consumer. There are indeed, certain costs which are practically identical for all consumers irrespective of demand, such as meter reading and collection, but many other costs, particularly capital charges and maintenance of capital plant, tend to be higher—though not necessarily proportionately—with higher demands. Some means must be found, therefore, of spreading the service costs according to the extent to which overheads are attracted. It seems to me that the readiest means of doing this is to grade the service charge according to the size of meter; this is an indicator not so much of total demand as of maximum demand, which largely determines the amount of capital expenditure required to meet it. Such a method of spreading service charges would automatically benefit consumers with a good load factor because the meter, and consequently the service charge, would be smaller per therm of total gas used.

I visualize, therefore, as the ideal tariff in Paisley a compulsory service charge varying from £2 12s. a year (1s. a week) for domestic consumers to perhaps £1,000 a year for very large consumers and all gas at a price of 1s. a therm; and of course similar tariffs elsewhere related to local costs. Such a tariff would in my view be truly promotional; it would encourage diversity of use because extra gas used for different purposes at different times of the day would attract no extra service charge; and when the price of gas was compared with that of other fuels the comparison would tend to be with 1s. a therm commodity cost rather than with overall cost—and this would indeed in many cases be a true comparison for extra consumption. The electricity industry does the same, though in some respects somewhat more indirectly. The industrial consumer pays a fixed charge related to maximum demand, and because of the lighting monopoly the domestic consumer pays a disguised service charge in the form of high rates for a proportion of his consumption determined by the number of rooms or lighting points. Finally, the Gas Act, section 53 (5), specifically authorizes the inclusion in a tariff of a standing charge.

If the principle is sound, if it is good economics, good sales promotion and therefore for the ultimate good of the industry and of its consumers, should we not already be taking steps to bring about a general acceptance of the idea? With this in mind I make the following suggestions for your consideration and critical comment:—

(1) The present tariff might be retained as the basic tariff but with suitable modifications, e.g., to permit, as already suggested, of price changes other than an exact penny per therm or 4d. per 1,000 cu.ft., or to give a better graduation of the block sizes.

(2) Alternative two-part tariffs should be offered to domestic and possibly also to the smaller non-domestic consumers, the fixed charge to be related to the size of the meter.

(3) To finance the inevitable initial loss of revenue arising from the offer of alternatives in (2), a reasonable charge should be made for all service visits and there should, in addition, be a nominal standing charge for all consumers (except those on the two-part tariff) of 3s. 4d. per quarter. If it becomes necessary to meet higher costs the standing charge should be raised but not the gas price; conversely the benefit of lower costs would go to the gas price. In this way a gradual approach would be made to an effective standing charge and a universal two-part tariff.

WHERE IMPROVEMENTS MUST BE MADE

by D. J. MAUNDER, M.Inst.Gas E., A.M.Inst.Fuel,

STATION ENGINEER, PAIGNTON, S.W.G.B.

RECENTLY the gas industry, in common with certain other fuel industries, has entered upon a new phase of its development—as a nationalised utility service; and some brief appraisal should be made of its achievements during the past seven years.

This time has been spent largely in getting 'the house in order' and in most Boards has been followed by the centralization of production and administration and the development of the associated integration systems. Relatively little progress has, however, been made in improving the service to our consumers. Some improvement of the physical qualities of smokeless solid fuel has been brought about and in certain areas a better gas supply has been made available. Appliances have improved in detail, but fundamental advances have lagged behind, while our principal product—gas—is still seriously imperfect by containing impurities which on combustion give rise to an unpleasant odour and cause corrosion in its widest possible meaning.

Of the fuel industries as a whole, remarkable progress has been made in their respective spheres, but little has been achieved in integrating and co-ordinating their individual efforts into a complementary and balanced fuel service. As a result the community in general are no less confused as to how best the country's residual indigenous fuel resources can be utilized.

Proper Perspective

The future development of the industry has of recent years been obscured by the dramatic appearance of nuclear energy as a source of power. The influence of this new force on the pattern of fuel and power supplies has now been brought into its proper perspective and it is reasonably certain that no appreciable contribution to the country's fuel resources can be expected for the next 20 years or so. It is equally certain that the demand for fuel and power in both the industrial and domestic fields will increase. But for a considerable period nuclear power, together with fuel oil, will only fill the growing gap between the coal available and this demand. In addition a Clean Air Bill will offer immense opportunities for the development of our two-fuel business. It will be up to the industry to see that when changes are made from traditional fuel used in traditional appliances, its products are associated with the new equipment.

Development of gas sales in the domestic market must be fostered principally by competitive tariffs, and I suggest that more imagination should be shown by our appliance manufacturers in their design of equipment with particular reference to its appearance and the incorporation of automatic and time saving features. Such items as the automatic ignition of cooker burners, together with the provision of time controllers should be made available at the earliest opportunity.

Is it not high time the industry accepted that electricity must be used as an auxiliary if the appliances we offer are to have the same usefulness and sales appeal as those of our principal competitor? Let gas appliances boast the superficial features of their counterparts in addition to their own unique feature of controlled heat.

In the field of space heating, due consideration should be given to competition from oil as well as electricity, for it is becoming increasingly obvious that oil burning convector heaters are rapidly gaining in popularity.

Its very favourable running costs are partially responsible for this trend but considerable importance is attached to the low sulphur content which, in the best proprietary brands, is less than one-tenth of that present in the equivalent of town gas.

Attractive tariffs, competition to those of other heat services, are the foundation on which increased business can be built up and our efforts must be directed by every available means to hold them at a steady value.

The experience of the post-war years has been a continual struggle against alternating increases in raw material and labour costs and since nationalisation the results of concentrated effort to effect greater efficiencies have been more than swallowed up in this unequal struggle. The industry is faced with the enigma of being entirely dependent on coal as its chief raw material, and of being powerless to influence its cost or even determine its quality. In general, however, the overall efficiencies of the remaining production stations are of a high order and the fruits of the integration systems are already being gathered, but it is also conceded that the carbonizing efficiencies of conventional systems are at a maximum and little advance can be expected to affect materially the economies of gas production.

Abstracts from the Presidential Address to the Western Junior Gas Association at Taunton on April 21.

There is of course no answer to this riddle and if our tariffs are to be made more competitive, attention must be given to improving the purification processes and increasing the residual yields as well as to the investigation of new means of gas production.

Purification, for the removal of hydrogen sulphide, has been explored from many angles but all efforts have been hampered by past legislation which is at variance with present-day requirements. On the one hand, hydrogen sulphide has to be reduced to a negligible concentration while on the other sulphur compounds present amount to almost 200 times the permitted hydrogen sulphide sulphur content.

Less stringent regulations would not result in a worsening of the sulphur position for the industry knows full well the undesirability of such a trend, but a favourable revision of the regulations would encourage dynamic methods of purification as well as permit a reduction in the margin of reserve plant capacity necessary to meet day to day contingencies.

Use of Pure Oxygen

Another feature of hydrogen sulphide removal that warrants attention is the substitution of commercially pure oxygen for air admitted for *in situ* revivification purposes. Atmospheric oxygen has successfully fulfilled this need in the past, but the attendant nitrogen has the effect of reducing, *pro rata*, the capacity of the purification plant and the thermal carrying capacity of the distribution systems that follow. But for the presence of this nitrogen, the declared calorific value of town gas could well be raised without sacrificing any of the existing advantages of straight gas dilution, while the power required for gas and air exhausting and gas compression would be reduced by a significant amount. Any savings on gas compression costs are of particular importance today, for unlike pre-vesting times the proportion of gas 'sent out' by compressing is now considerable and with further integration the potential savings possible will further increase.

So long as the bulk of gas continues to be purified in orthodox dry-box systems this aspect of the process must be

carefully re-examined in the light of present-day circumstances and conditions for, with gas production now grouped at large centres, it is to be hoped that economical supplies of oxygen will be forthcoming.

Any relaxation of the regulations governing the presence of hydrogen sulphide should be accompanied by new measures to reduce the quantity of organic sulphur compounds, for while a great deal has been said of the merits of reducing or entirely eliminating these impurities, very little has been accomplished. Quite properly the financial aspect of their removal has influenced the present stalemate but I suggest that the industry can never hope to flourish if its product is inferior to that of its competitors and below the standard we all know should prevail.

It is well known that the removal of these compounds is most imperative if certain spheres of utilization are to be exploited and the heavy burden of appliance maintenance reduced. Our great industry must once again take the lead and set the standard as it has for so many years past with smokeless fuels and the time is now ripe for our product to be sulphur—as well as smoke—free. The abolition of chemical pollution of the atmosphere must surely come.

Stop-Gap Measure

The removal of sulphur should be properly carried out at the point of manufacture, but the installation of the necessary removal plant will take time, and I suggest, as a stop-gap measure, the purification of the gas used in conjunction with flueless appliances and certain water heating equipment. Is it not possible that gas when used for such purposes should be freed of sulphur immediately prior to combustion by the attachment of a catalytic purifier? This suggestion at first sight might seem visionary, but let us not forget that both in this country and in America catalytic converters, for the elimination of hydro-carbon and toxic combustible compounds normally present in petrol and diesel engine exhaust gases, are in production. Is it not reasonable to hope that with enterprise our own not altogether dissimilar problem can successfully be overcome, and an equally inexpensive and modestly proportioned attachment made available?

The other material sphere to which I suggest further attention should be given is that of the by-product breeze—which chemically is comparable with its parent coke—but which commands a market price that bears no relationship to its heating value. Loss of revenue resulting from the formation of breeze, which otherwise might have been coke, necessitates that our gaseous fuel has to subsidize this inefficiency of solid fuel production! The extent of this loss, assuming ideally our solid fuel could all be produced as coke, amounts in the case of our own Board to a figure in the region of £600,000 per annum and which represents over 1d. on every therm of gas produced.

No Reduction

Breeze production since nationalisation shows no reduction and if anything a slight increase. This problem is likely to worsen further as the quality of our graded fuels is improved, a feature clearly called for in the Beaver report, and it will assume even greater importance if the relative value of coke is further enhanced. If, therefore, further revenue is to be obtained from the sale of residuals the breeze produced must in some way be reformed so that full use can be made of its potential heating value. By so doing, not only could our gas production costs be reduced but also a further tonnage of smokeless fuel would be made available for domestic consumption. This reforming or 'cure for the malady' can be achieved by the process of briquetting, a well proven technique whereby small sized fuels have a binder admixed and under the combined influence of thermo and pressure treatment are formed into ovoid shaped products. Very considerable success has been achieved, notably by the Coal Board and other patent fuel producers, in the reconstitution of fuels occurring in a state of fine sub-division and indeed promising results have been obtained when treating fine breeze.

Cost of processing the breeze would be considerable, but should not absorb much more than half the increased revenue resulting from the enhanced market value. And it may well be that as the breeze briquetting technique is further improved the economic margin would become still more favourable. The adoption of such a policy would not only render available a greater quantity of graded fuel, but would bring about a proportionate increase of revenue from the sale of this residual.

Gas storage capacity, considered necessary for the safe operation of undertakings, has during the past decade gradually been reduced and, with the maturing of the integration plans, the position should again be reviewed.

Holder maintenance costs particularly of painting, represent heavy annual charges which are likely to increase steadily with the growing age of the plant. For ease of operation the greater the storage capacity the better, but it is questionable if we can justify and afford the luxury of many of the small holders at outlying stations. Before the link-up of the permanent production stations, integration had proceeded radially from each main station to supply small works in neighbouring districts. At that time these isolated production stations were solely responsible for considerable areas of supply, and it was reasonable that storage at the smaller units should be retained so long as any element of uncertainty of supply remained. There has, however, been widespread evidence since link-up, that in a considerable number of cases these smaller holders at outer stations have not carried out their primary function of meeting the diversity of demand, for very often they have been maintained full throughout the 24 hours. It follows that if these holders were taken out of commission the load factor of the distribution systems would not be worsened materially.

Any consideration of the technical processes and their costs would be incomplete unless mention was made of the influence capital expenditure has on the cost of our products. Depreciation and interest charges in round figures account for 3d. of the monies received from every therm sold throughout the country. Considerable sums have been expended by the various boards on new production stations, in addition to the enormous outlay on integration mains, and further expenditure on new plant is inevitable if the industry's pre-eminent position is to be maintained. Why, when such great advances have been made in the design and development of plant and process techniques, has the industry been so reluctant to break away from the outdated custom of housing so many items of its plant in buildings so needlessly extravagant and durable out of all proportion to the likely life of the process plant they house?

Primitive Plant

In bygone days the plant available, judged by to-day's standards, was primitive and needed to be housed to achieve the protection necessary to ensure reliable operation and economic life. But to-day, when modern plant, with few exceptions, is totally enclosed, self lubricating, automatically controlled and moisture, dust and gas proofed, there is no real need for housing at all. Experience has shown confined spaces to be the invariable environment of explosion and gassing occurrences and yet far too much plant associated with these hazards continues to be housed. Can a page not be taken from the books of related industries—notably the oil industry—where almost all its plant stands in the open. Unless an enclosing building is absolutely necessary to achieve a better or cheaper therm it should not be entertained.

SMOKE ABATEMENT SOCIETY

SEVERAL useful new features are to be found in the 1956 National Smoke Abatement Society *Year Book* and annual report, publication of which coincided rather nicely with the final stages of the Clean Air Bill. Increasing interest in the Society is indicated by rising membership and attendance at the annual conference. The number of local authority members now exceeds 500, and there are also many individual and corporate members.

Among the new features, is a comprehensive synopsis for use by lecturers, speakers, and students, entitled, 'The Clean Air Case,' and a concise history of air pollution in Great Britain. Other features include a summary of the work of the Fuel Research Organization of the D.S.I.R., statistics on atmospheric pollution, an account of the National Industrial Fuel Efficiency Service, and a summary of the present legal position.

The volume is attractively produced, and the cover photograph, selected from the Society's photo-library, is a striking example of a smoke nuisance from a small steamship.

The Institute of Fuel

DOMESTIC HEATING IN THE U.K.

—*Special Study Conference*

(Continued from last week)

THE opening conference of the Institute of Fuel's special study of domestic heating in the United Kingdom—'present and future'—was taking place in London on May 1 and May 2 under the direction of Dr. G. E. Foxwell, C.B.E. The following is the second of a series of abstracts of some of the papers presented.

SESSION ONE: FUELS

Dr. Foxwell

The first section (12 papers) of this extensive symposium is devoted to the fuels available for domestic heating. It is introduced by Dr. Foxwell in 'a general survey of the conditions of domestic heating in the foreseeable future.' Much of it, naturally, is a restatement of his well-known Appendix to the Beaver Report and of his subsequent addresses on this subject. But his opening paragraph must be quoted in full:

> 'To forecast what fuels will be used for domestic heating in the immediate, and the more distant, future is not an exercise in the pure technology of manufacture. Among the considerations that must be taken into account are: The national fuel position, including the availability of raw fuels to be used directly or to be converted into what may be termed refined fuels; the type of domestic appliances likely to be available for burning fuels or converting energy in any form into heat; the predilections of householders as moulded and modified by changing social conditions; the price that the consumer can afford to pay in the light of the standard of living that will prevail and advance in the efficiency with which potential heat and energy are converted into "useful" heat; and, by no means least important, the Government Clean Air Policy.'

On the national fuel position Dr. Foxwell hopes that, since we are likely to be fuel importers for the future to the value of £150 mill. to £200 mill. a year, it will be self-evident to any Chancellor of the Exchequer that houses must be designed and built for the installation of modern appliances which collectively will stop the appalling waste of domestic fuel. Fuel imports consist almost wholly of oil; its use should be confined, in the first place, to those operations where its properties render it specially valuable or where it can displace more coal than is represented by a basis of thermal parity. 'It is not likely that oil will make a large contribution to domestic heating; not large but nevertheless significant. The capital and fuel that we can afford to expend in producing electricity is best used for industrial purposes.'

On social conditions: 'We live in a period of rising standards of living. It is within our power to improve immensely the standard of heat comfort without any additional consumption of fuel. It is against the national interest to reduce the cost of house construction (by less insulation or less efficient appliances) at the expense of higher fuel consumption. In general terms, having regard to depreciation rates, it is worth while to spend £100 on better house construction (including appliances) to save 10 cwt. of coal a year.' The amount spent on fuel by domestic consumers is modest. Over the years 1948-53 the proportion of the total personal expenditure on goods and services, that on fuel and light was less than 4%. 'This suggests that within reasonable limits the price of fuel is relatively unimportant; an increase of even 50% in fuel costs would not seriously affect private purses—modest advances in the price of domestic fuels—can be absorbed without hardship.'

Dr. Foxwell repeats the view 'that while there will be increasing demand for the more refined fuels for intermittent use, and for use throughout the year for water heating and cooking, the bulk of the domestic heating load for some time to come must be provided by solid fuel.' And we may infer that he holds the view that this can only be supplied in sufficent quantity 'from existing sources' (*i.e.*, coke) to produce which a further 10 mill. tons of additional carbonizing capacity must be provided. Quality ranks equal in importance with quantity. There will be room for the highly reactive low-temperature cokes—particularly for a luxury market—'but the bulk will be made by carbonizing at higher temperature in gas retorts or coke ovens' and, he added, 'a British Standard of coke quality is now being drawn up.'

Free-Burning Coke

The question is discussed briefly, to what extent existing processes can be modified to improve the ignitability and 'free burning' properties of coke. Recent work is referred to. Some possibilities are: To carbonize low-rank coals, 800 or 900, in graded sizes, which is being done successfully in continuous vertical retorts at many gasworks; to blend low and high rank coals (with the disadvantage of a fine ash); to mix low-rank and gas-coals (the ash is of larger size); to carbonize at medium temperatures leaving three volatile therms per ton in the coke; to carbonize at true low temperatures. The decision which of these methods to use will depend on economic considerations and the availability of the several types of coal.

The production of smokeless solid fuel must be profitable to the producer (depending largely on the coal/coke price ratio); the consumer will expect a favourable ratio of the cost of a useful therm from coal to that from coke. Dr. Foxwell concludes that there seems no reason why the necessary smokeless fuel should not be produced at a reasonable cost and sold to the public at a price that would not adversely affect the cost of fuel and light; 'a modest increase in the (domestic) budget from this cause would (should) be balanced by lower expenditure in upkeep, cleaning and improved health.'

Repeating his programme of the Beaver Report for the provisions of the necessary raw coal, he concludes: 'A very large tonnage of coking coal is now burnt under boilers and in furnaces and could be replaced by non-coking coal or oil without detriment.'

SMOKELESS FUELS PRODUCED BY THE GAS INDUSTRY

J. E. Davis

The fact that the London fog of 1952 gave rise to public clamour is itself a measure of the progress already made in the mitigation of smoke pollution, says Mr. Davis. Fifty years earlier it would have passed with little comment. 'The gas industry is quietly proud of the good work it has done.' A major part of the improvement in the atmosphere in the early years of this century is due to the replacement of the coal-consuming kitchener by gas and electric cookers, the growing popularity of the coke boiler for hot water supply and, in the late 1920's, the gas-ignited coke grate.

In the early 1930's many gas undertakings had realized that, provided it was used to a sufficient extent, gas itself could compete on cost alone with solid fuel. Attractive domestic tariffs were introduced and substantial progress had been made when war came, followed by price changes which with other difficulties destroyed the structure which had been built.

Mr. Davis referred to these historical facts in order to show that the gas industry has a wealth of experience in this matter of domestic heating. Before the war it was making the business of smokeless fuel supply pay its way. Since that time, however, the price of coal to the gas industry has increased by *five times*, while that to the domestic consumer has increased to *three times* the pre-war figure. When coal to the gas industry was relatively cheap, all the costs of processing and handling could be charged to the gas consumer who could still get gas at a price which permitted him to use it in place of raw coal. To maintain such a position today would be to price gas out

of the market and it is now necessary to make gas and coke each stand independently on a sound economic basis.

But before he reaches that point, Mr. Davis has a gently ironic passage about 'a kind of youthful enthusiasm tending to ignore previous efforts'—including the long experience of the gas industry—'the hard-won experience of earlier years, and to suggest that this, that or the other nostrum is the only cure. This enthusiasm has had some curious results.' There was what he called 'the post-war excursion into approved solid-fuel-burning appliances.' Originally these were intended to burn smokeless fuels, with which indeed they would also be more efficient. But this was soon overlooked and they claimed instead to be 'all-night' burning. 'To complete the absurdity there was the little flirtation with "nutty slack," recommended for banking such fires at night. Thus the whole operation ended up with an enormous sale of appliances which in all too many cases are no more efficient and no less smoke producing than those which they displaced. If clean air and fuel efficiency are to be achieved, clearer thinking than this is necessary and future developments should take account of the lessons of the past.'

The Supply of Coke

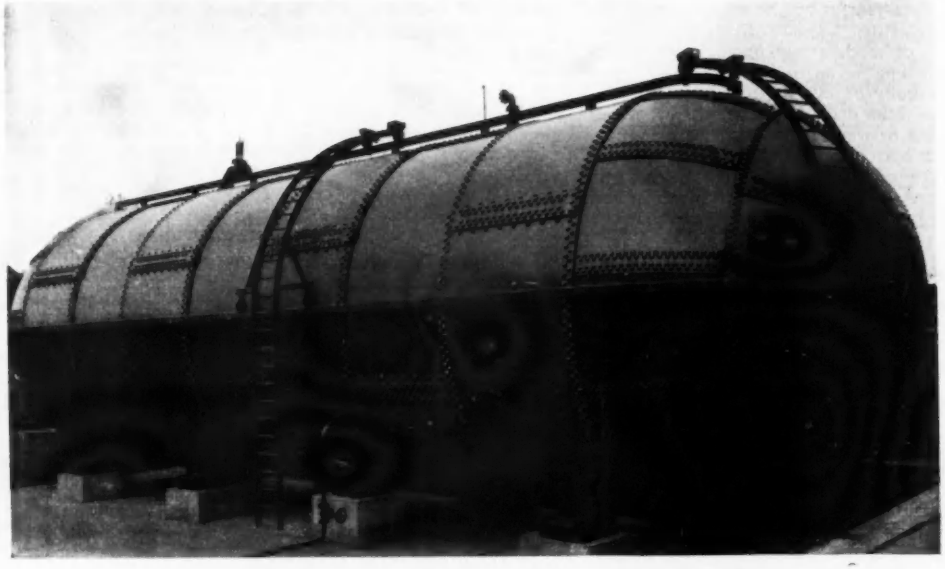
Mr. Davis compares the two estimates which have been made of the quantity of solid smokeless fuel required to replace the coal now burned in the 'black' areas. Buist *et al* found that 3.2 mill. tons more coke should be made per annum and Foxwell 7.3 mill. tons. It is often tacitly assumed, in view of the (also assumed) preference of the public for the open fire, that the coke is to be used for this purpose. 'Most people, speaking of an open fire, have in mind that blazing white-hot furnace which adorns the entrance hall of their favourite hotel —It is probably emitting upwards of 20,000 B.Th.U. per hour of radiant heat. In the room of 150 to 200 sq. ft. where most people live, such a blaze would be intolerable.' Such a room will generally require a heat output of between 4,000 and 6,000 B.Th.U. per hour rising to about 8,000 in the coldest weather. This means that for a very great part of the time the fire must operate at a restricted output when it tends to lose its attractive appearance. 'For rooms of small or moderate size a brightly blazing fire is normally tolerated only under conditions of great inefficiency.' The point of these considerations is that the properties needed in domestic coke vary according to the apparatus in which it is to be used. The open fire requires coke of low bulk density and low ash content 'best prepared from low rank nut coal in continuous vertical retorts.' The stove requires coke of high bulk density; reactivity and ash content are relatively unimportant, though pieces of shale are undesirable and it is best manufactured from high or low rank coals, finely crushed and carbonized in static plant.

The tolerance of properly designed coke-burning appliances is high and if strict control of the degree of carbonization is practised, moisture content limited and accurate grading insisted upon, the coke from any of the normal gas coals carbonized in either static or continuous plant can give entirely satisfactory service in both open fires and stoves, maintains Mr. Davis. An important point is that any particular consumer must be supplied regularly with the same type of coke. The demand is highly seasonal and heavy stocks must be carried somewhere. Gas boards carry a far heavier stock than any other suppliers. Few people have in their homes adequate fuel-storage capacity and experience is that even where the storage is available, provident habits are not.

Price

It may be a platitude to say that price is a compromise between cost and value but it is still worth repeating because it is so rarely understood. As a domestic fuel coke is consumed with a thermal efficiency in almost all appliances about 25% higher than bituminous coal; its value per therm is about 25% higher than that of coal. On the other hand the thermal content of a good household coal is about 300 while that of coke is about 270 therms.

Therefore, the *value* of a ton of coke is 1.125 times the price of a ton of coal. The *cost* of a ton of coke is much more difficult to compute. Mr. Davis says: 'It would not be profitable to construct new carbonizing plant to make coke



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for the domestic market unless the gas also could be sold, and even then the 'price obtainable for coke ex works should be 1.5 times the price paid per ton of coal.' Experience of the gas industry (and Mr. Davis has personal experience of this) in producing low-temperature coke suggests 'that the cost of smokeless solid fuels of this type is twice the price of coal at the carbonizing plant plus the cost of delivery to the customer, and for these fuels such prices have not been unusual.'

Resources

The Symposium on Coke had shown that modification of existing practice could produce 2.87 mill. tons more coke per annum. The Beaver Report had assumed that 10 mill. tons more coal must be carbonized and that the gas industry would be left with 440 mill. therms of gas per annum to be sold outside the domestic market. 'A far better and more practical proposal would be to carbonize 5 mill. tons additional coal to yield 2 mill. tons of coke or 375 mill. therms of gas and to sell this gas on the domestic market where, for space-heating, it would be equivalent to 2.68 mill. tons of coke.' The estimated cost of building the necessary new plant is £75 mill. 'by no means excessive in relation to the £250 mill. per annum estimated by the Beaver Committee as the annual cost of air pollution.'

Gas

The advantages of using gas in the place of coal for domestic space-heating, including the abolition of smoke, sulphur, ash handling, road transport of fuel and fuel storage in houses, are so great that the possibility of encouraging development on these lines deserves much more attention than it has received.

Experience in the pre-war years when, with appropriate tariffs, gas was replacing coal in many houses, showed that for space-heating six therms of gas replaced one cwt. of coal, or seven therms replaced one cwt. of coke. The six therms of gas which would replace one cwt. of coal require for their manufacture about two-thirds of a cwt. of coal; thus the fuel-saving objective is achieved at the same time as the several amenities. 'The fashion at the moment is to regard it as an impracticable ideal and it seems certain that (its development) is likely to be slower than development in the use of coke.'

The problems of peak load can be overcome and it would be wrong to come to the conclusion 'that the supply of gaseous fuel for domestic heating is a problem beyond solution by modern techniques of gas production.'

Conclusion

Mr. Davis' conclusion is that 'the gas industry is able and willing in the cause of clean air and fuel efficiency to make available to the domestic fuel consumer such quantities as may be required of smokeless solid fuel, and offers its not inconsiderable experience in this field of social development. Realizing that in its initial phases the movement from coal to coke is easier to achieve than the conversion from coal to gas, the gas industry will make the provision of adequate supplies of coke its first objective. At the same time the industry would give a reminder that the use of coke is but a partial solution of the problem, and that the complete solution can be found without excessive cost or technical difficulty through the extended use of gas.'

SMOKE CONTROL AREAS

H. D. Greenwood

The author discusses the production of domestic smokeless fuels required for the establishment of smoke control areas and calls for 'some form of general plant, built up on the requirements of each area.'

Some people will wish to continue to burn raw coal. One reason suggested is that it will be almost impossible to obtain adequate supplies of suitable solid smokeless fuels. Then it is feared that local authorities may wish to institute smoke control areas before such supplies are available. On the other hand, Mr. Greenwood alleges, producers are disinclined to increase supplies before they are sure that demand exists and that the public will pay the price required. High temperature coke constitutes the greater part of the smokeless fuel used today and in spite of relatively small contributions of other types, with increased use of gas, electricity and oil, 'the problem can only be solved by larger production of manufactured fuels.' It is essentially a national problem, 'and there would seem to be strong arguments in favour of a broad national plan.'

Mr. Greenwood reviews what has been said, on the quantity of smokeless fuel potentially available, in the Beaver Report and the Coke Symposium. He analyses the position in the areas. 'In those areas where gas coke output is small relative to the demand for smokeless fuel a considerable increase in local production would appear to be involved.' The problem as a whole, and particularly that of balancing coke and gas demands, may vary considerably between one area (and another).

Analysing the several types of fuel available on the basis of gas for ignition and time to reach a cheerful fire, he finds that gas for ignition varies from 6,170 B.Th.Us. for coalite, 6,600 for vertical retort coke, to 9,000 or 10,000 for coke oven cokes, while the time to obtain the cheerful fire rises from 25 minutes (with coalite), 38 minutes (with vertical coke) to 45 and 60 minutes with oven cokes—these under standardized conditions in the open grate. It has been suggested that the British Standards Specification now under consideration will stipulate that 'fuels taking more than 50 minutes to reach a cheerful fire and over 7,000 B.Th.U. in gas for ignition should not be regarded as satisfactory.'

On the basis of London prices and 'the lower of the range of efficiencies given in the Beaver Report' he finds that cost per effective therm for continuous room heating with Grade IV coal in an 'improved grate' would be 26d., while gas coke will do it for 21d. falling to 16d. in an openable stove. Coalite in an open convector grate would get down to 22d. (against 18d. with gas coke), while phurnacite in the openable stove would cost 23.1d.

Mr. Greenwood discusses the several methods which have been proposed and experimented with for the production of coke and other smokeless fuels for the open fire—using the lower rank coals in retorts and coke ovens—carbonizing at lower temperatures—carbonizing briquetted coals (phurnacite)—methods employing internal heating (Rexco and the Rochdale process). 'It has been shown that (suitable fuels) can be made in any of the standard types of carbonizing plant, provided suitable coals are available and/or that operating conditions and size of carbonizing chambers are suitably modified.' He presents a table showing the comparison of costs of coke production in two standard processes; continuous vertical retorts heated by coke, and coke ovens heated by coke-oven gas—in both cases operated on maximum coke output, carbonizing 1,000 tons of coal per day.

COMPARISON OF COSTS OF COKE PRODUCTION

	Coke ovens at a gasworks		Coke ovens at a colliery		Continuous vertical retorts at a gasworks	
Costs:						
Coal		119		100		130
Operating and Capital		36		36		40
		155		136		170
Less:						
Revenue from:						
Gas	32		27		66	
Tar, etc.	21	53	21	48	26	92
Net cost of coke		102		88		78
Coke yield	65%		65%		50%	
Relative cost of coke (*ex* works)	157		135		156	

'Both systems can be operated to yield a reactive coke, but in general that from the vertical retort will have the greater reactivity.' The estimates are based on gasworks within 20 miles of the collieries, as for instance in smoke control areas in Yorkshire, the Midlands and on the North-East Coast. Gas transmission from colliery to gasworks is allowed for at 1.0d. per therm. It will be seen that coke made at the colliery is the cheapest; at the gasworks costs are practically equal in the two types of plant. Mr. Greenwood recognizes that there are difficulties in the transport of coke and in the storage of gas in the summer.

NATURALLY-OCCURRING SMOKELESS FUELS

Eric Brooks and Islwyn Jacob

'Smokeless coals consist of a range of naturally-occurring coals which, owing to their intrinsic chemical and physical properties, and without any form of pre-treatment except the usual cleaning and sizing operations at the colliery, produce little or no smoke when used in any type of solid-fuel appliance.' Anthracite (rank 100), sub-bituminous (rank 201) and semi-bituminous coals (ranks 202, 203/4) all have a volatile content below the 20% which is the specification for fuels which would be considered suitable for use in the smoke-control areas envisaged in the Clean Air Bill.

By far the greatest reserves of these coals are found in South Wales, with some semi-bituminous coals in Kent 'and some heat-altered, non-caking coals in Durham and Scotland.' Calorific value may be as much as 1,500 to 2,000 B.Th.U.s per lb. more than bituminous 'house' coals. Bulk density is high, anthracite 48 to 50 lb. per cu.ft., sub- and semi-bituminous coals, 45 to 47 lb. per cu.ft.; sulphur content is relatively low; the majority of these fuels contain less than 5% ash. A table of recommended sizes for different domestic appliances is given. The present commercially disposable output of coals of 20% volatile content and less in the South Wales field is about 13.85 mill. tons per annum of which about 20% is produced in sizes suitable for domestic appliances. Some 600,000 tons of 'low volatile duffs will be used for the manufacture of that other important smokeless fuel, Phurnacite.'

LOW TEMPERATURE CARBONIZATION

Vaughan Cowell

This paper gives an account of the development of low temperature carbonization in Britain over the past 30 years. The Coalite plant is described and details are given of the Rexco process developed under patents held by the National Carbonizing Company. It is estimated that the additional 5 mill. tons per annum of solid smokeless fuel needed to implement the coming Clean Air Act could be produced by the Rexco process for a capital expenditure of £15 mill.

The paper will be read by most gas engineers as a salutary exercise in digesting criticism (explicit and implicit) of their own techniques. It opens with quotations from Lord Samuel's report on the coal situation in 1925. On the subject of low temperature carbonization, that Report recommended that if the products were of greater value than the cost of coal plus the cost of treatment, the wealth of the country would be increased, and that such processes should be encouraged.'

Referring to the shortage of solid smokeless fuel to implement the clean air policy, Mr. Cowell says: 'The possibilities of increased production on any substantial scale commensurate with requirements are very meagre; in regard to gas coke, the Gas Council maintains that it is uneconomic to carbonize coal to produce coke for sale.' And later: 'Regarding gas coke, the most modern and economic of gas techniques of gas manufacture are leading away from coke production; the trend is towards total gasification and production of town gas from oil and from methane, so that as time goes on less rather than more coke will be produced by the gas industry. A bigger output of coke can only be made available by additional carbonization of coal, and to be attractive to the domestic consumer it should have free-burning qualities not possessed by present supplies. The availability of good gas-making and good coke-making coals is even now inadequate, and the supply is diminishing, so that the hope of obtaining better quality gas coke is receding.'

The open fire is a British institution and to abolish the millions in existence is impracticable. The only solution to the domestic smoke problem is to provide a solid smokeless fuel, as good or better than coal, which can burn in the same appliance, and which costs no more than coal. Among other requirements it should be 'produced from the same coal as it is destined to replace, *i.e.*—the weakly caking or non-caking coals now used for domestic service.' It is claimed that the only fuel which meets the specification, both for open fire and closed stove, is Rexco. Its predecessor, Coalite, is briefly described. The Parker cast-iron retort is well-known. 'The commercial principle behind the Parker process was sound.'

The Rexco Company regards heat-storage cookers, hot water boilers and stoves as its main market, with the open fire as a winter demand; 54% of the output in the larger grades being sold for these purposes, 10% (below ¾ in.) is sold at 45s. per ton to power stations, but a portion of this, ¾ to ¼ in., can be taken out for gravity-feed boilers. 'The total to be sold at the price of smokeless fuel could be 92% of the fuel produced.' The disposal of surplus is under consideration; one-fifth of it will generate all the electric power required by the plant. It is claimed that the tar is 'the least cracked of the tars made by carbonization in commercial production in this country.' The prices of Rexco are mainly governed by the cost of coal; accounts show that this represents 84% of the total cost of production, with 7.5% labour, 1.8% power and 2.3% standing charges. It is claimed that sales of surplus gas and tar will reduce the price of the Rexco fuel to 'approximately the price of Group I household coal.'

And the final claim is that: 'There are three reasons why the treatment of coal by scientific methods should be rapidly adopted: First, for the advantage to the national economy by increasing the wealth to be derived from coal; secondly to reduce air pollution; and thirdly, to lessen the cost of heating to the domestic consumer. Low temperature carbonization can play an important part in attaining these objects owing to the low capital cost of the plant (£2 per ton of annual coal throughput), the small labour force required and the low maintenance and repair charges (less than 2s. per ton of throughput since the plant was built).

COKE OVEN COKE FOR DOMESTIC PURPOSES

G. W. Lee and Dr. R. A. Mott

The paper is devoted to the possibilities of using for domestic heating a proportion of the product of the coke-oven process 'which has been developed—with the traditional and principal aim of producing a coke satisfactory for blast furnace practice.' It claims that, while the sizes passing over the grizzly screen of 2 to 3 in. spacing will be generally used for metallurgical purposes, the undersizes can be used for domestic purposes. It is contended that with suitable modifications of the blend and other details, B.C.R.A. Grade 2, mean size 1⅜ in., range 2 in.-⅞ in., would be suitable for properly designed open coke-burning grates. All grades, up to a mean size 2¼ in., Grade 1, are suitable for closed and openable and central heating.

The important properties of domestic coke are considered in detail, 'the dominant factors being size and, for the open grate, reactivity. In general, the larger the grate area and the fuel capacity of the appliances, the less critical become the properties of the coke, so that with an appliance of 1 sq. ft. grate area and 1 cu.ft. capacity, size, reactivity and purity no longer markedly influence the ease of control of the appliance.'

In the manufacture of 'open-grate coke' in the coke-oven, 'one simple solution is to assess the end of carbonization as the time at which the centre of the charge attains a specified temperature *e.g.*—900° C., but this is not easy to carry out in practice. Other methods are under consideration.' With regard to volatile content the authors postulate as desirable 2 to 2.5% (dry ash-free basis) with a C.A.B. of 0.05. The use of narrow ovens has been advocated—'in recent months the N.C.B. have been carrying out experiments to produce a freely-burning coke' in ovens approximately 9 in. wide. Among the conclusions relevant to the subject of the Conference, Mr. Lee and Dr. Mott concur in the demand for a national fuel policy, 'dominated by the need to use our coal resources in the most efficient manner,' the assessment of which is 'an economic problem of considerable magnitude.' Their view is that the maximum national benefit in increased economy of coal usage 'will not be achieved until open grates have been replaced by convector gas fires and closed or openable stoves as the chief units for domestic heating.'

(To be concluded)

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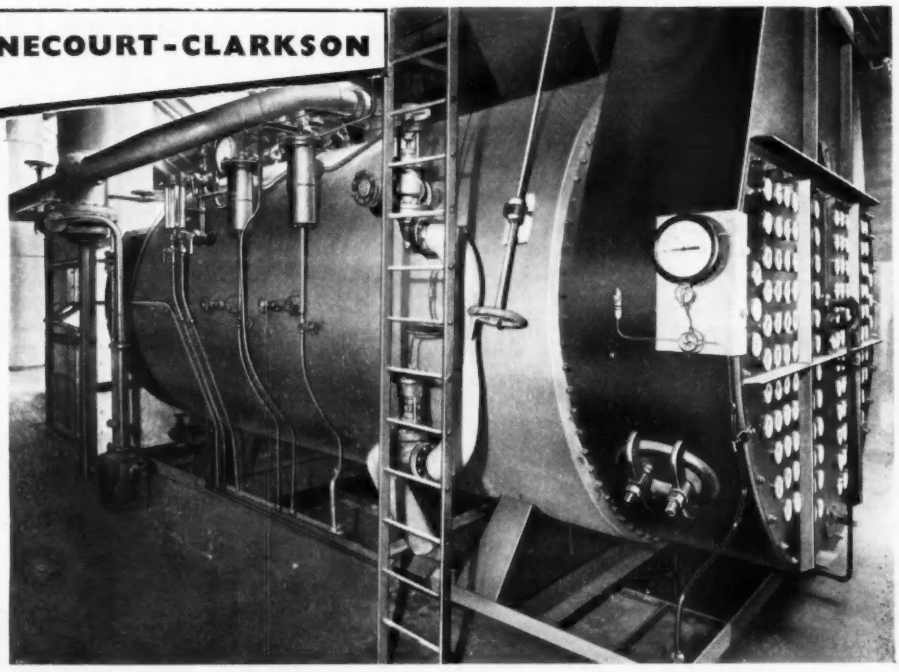

The illustration shows one of the Spencer-Bonecourt waste-heat boilers at Stoke-on-Trent Gas Works. Similar units are installed on all the Glover-West Continuous Vertical carbonising plant in this works.

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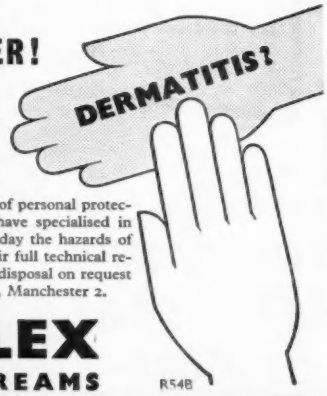

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The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with the names of two referees, should be addressed to Mr. C. F. W. Rendle, Divisional General Manager, West Midlands Gas Board, Newtown Road, Worcester, to reach him not later than May 21, 1956.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

BIRMINGHAM & DISTRICT DIVISION
VACANCIES FOR
ENGINEERING ASSISTANTS

APPLICATIONS are invited for a FIRST ENGINEERING ASSISTANT, A.P.T. Grade 11 (£850-£975 per annum), and a Second Engineering Assistant A.P.T. Grade 8 (£710-£790 per annum) of the National Salary Scales for Gas Staffs.

Candidates for both positions should be Associate Members of the Institution of Gas Engineers, or possess equivalent qualifications. Employment may be at any of the four Birmingham Gas Works, the productive capacities of which range from 21 to 53 mill. cu.ft. per day.

The duties of the First Engineering Assistant will entail supervision and technical control of Coal Gas, or Water Gas production, including some of the ancillary plant with direct responsibility to the Assistant Engineer. Considerable previous experience in work of this nature is essential.

The duties of the Second Engineering Assistant entail general assistance in the supervision and technical control of the same plant; some previous experience is necessary.

Opportunities will be afforded in both cases to gain a wide experience of large scale gas production.

The posts are pensionable, and the successful candidates may be required to pass medical examinations.

Applications stating age, experience, positions held and qualifications, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Gas Offices, Edmund Street, Birmingham, 3, to reach him not later than May 17, 1956.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

CHIEF ACCOUNTANT'S DEPARTMENT
SENIOR AUDIT ASSISTANT

APPLICATIONS are invited for the appointment as SENIOR AUDIT ASSISTANT to be stationed at the Board's Divisional Offices in Coventry.

The successful candidate will be responsible to the Board's Chief Accountant for the internal audit work of the Division.

Applicants should preferably be qualified accountants and should have had experience of the audit of accounts of a public utility undertaking.

The salary for the post will be within A.P.T. Grade 11 (£850-£975 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with the names of two referees, should be addressed to the Industrial Relations Officer, West Midlands Gas Board, 6, Augustus Road, Edgbaston, Birmingham 15, to reach him not later than May 17, 1956.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

NORTH STAFFORDSHIRE DIVISION
TECHNICAL ASSISTANT,
STAFFORD DISTRICT

APPLICATIONS are invited for the above vacancy.

The manufacturing plant comprises Vertical Retorts, Onia-Gegi Oil Gas Plant, and Carburetted Water Gas Plant.

Applicants should preferably be Corporate Members of the Institution of Gas Engineers.

The salary will be within A.P.T. Grade 8 (£710-£790 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with the names of two referees, should be addressed to Mr. J. E. Stanier, Divisional General Manager, West Midlands Gas Board, Gas Works, Etruria, Stoke-on-Trent, to reach him not later than May 14, 1956.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

SHROPSHIRE DIVISION
MANAGER, MARKET DRAYTON DISTRICT

APPLICATIONS are invited for the above appointment.

Candidates should have experience in the control of a small undertaking and a knowledge of the operation of horizontal retorts (machine charged) and all aspects of Distribution and consumer service.

The annual output of the undertaking is 40 million cu.ft.

The salary for the post will be in accordance with Grade A.P.T. 9 (£755-£855 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with the names of two referees, should be addressed to Mr. W. Oldham, Divisional General Manager, West Midlands Gas Board, Sidney House, School Court, Shrewsbury, to reach him not later than May 15, 1956.

J. C. INGRAM,
Secretary to the Board.

(*Classified advertisements continued on page* 434)

APPOINTMENTS VACANT (ctd.)

TECHNICAL ASSISTANT (FUEL) required by large integrated Iron and Steel Works in the Midlands. Applicants should preferably possess the Higher Grade Certificate of the Institution of Gas Engineers although those with similar qualifications will be considered. Work will consist of general technical control duties associated with the distribution of Blast Furnace and Coke Oven gas together with Holder maintenance and inspection. Organisation and supervision of trials and experiments anywhere in the works will also be involved. The successful applicant will be on the Staff of the Works Fuel Engineer and must fall within the age range 25/35. The housing position is good. Write in first instance, giving age, qualifications, experience to date and salary expected to the Manager of Personnel, Stewarts and Lloyds, Limited, Corby, Northants.

EAST MIDLANDS GAS BOARD

LINCOLNSHIRE DIVISION
APPOINTMENT OF SALES AND SERVICE OFFICER, SCUNTHORPE GROUP

APPLICATIONS are invited from suitably qualified persons for the position of GROUP SALES and SERVICE OFFICER at Scunthorpe at a commencing salary within Grade APT. 9/10 (£755/£920 p.a.), according to experience and qualifications.

Applicants should be capable of co-ordinating all aspects of consumer service, including the promotion and development of the sales of gas, coke and appliances to industrial, commercial and domestic consumers, and they should have sound experience of office administration and in the control of staff.

The position is pensionable, and the successful applicant will be required to pass a medical examination.

Applications giving details of education, training and experience, together with the names of two referees, should be addressed to reach the undersigned not later than May 16, 1956.

BERNARD CLARKE,
Divisional General Manager.

Belle Vue House,
Carline Road,
Lincoln.

NORTH WESTERN GAS BOARD

APPLICATIONS are invited for the following pensionable appointments:—

LIVERPOOL GROUP
DISTRICT SERVICE MANAGER—BOOTLE

Commencing salary £1,150 p.a. The area covers that of the County Borough of Bootle and the Urban District Council of Litherland.

The successful applicant will be responsible to the General Manager for all aspects of consumer service within the district, including the organisation of gas installation and maintenance staffs, the control of the showroom and general administrative co-ordination.

ASSISTANT ENGINEERS—PRODUCTION

The salary for the two appointments will be within Grades A.P.T. 8/12 (£710/£1,025 p.a.) according to age, qualifications and experience.

The successful applicants will be attached to various sections within the Group and will be employed essentially in the production of gas and other products. Applicants should be members of the Institution of Gas Engineers or be otherwise suitably qualified. A degree in engineering would be an additional advantage.

Applications should be made on the official form obtainable by writing to the Chief Personnel Officer, N.W.G.B., Liverpool Group, Radiant House, Bold Street, Liverpool, and returned to him within 14 days.

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AN opening occurs for a GASHOLDER FOREMAN to undertake Supervisory duties, including occasional inspection work. The post will be a pensionable staff appointment, and offers prospects of advancement to the right man. Applications giving fullest details of experience and present salary together with references should be made to No. 280, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

WALES GAS BOARD
RHONDDA UNDERTAKING

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER AND MANAGER to the Rhondda Undertaking which receives purified gas in bulk from Coke Ovens and from the Board's Grid system.

The applicant must have a sound knowledge and experience of modern distribution practice and of the management and administration of a gas undertaking. The applicant must hold the Institution of Gas Engineers Higher Grade Certificate in Gas Engineering (Supply) or its equivalent as a minimum qualification.

The commencing salary will be £1,050 per annum and the post is pensionable. The successful applicant will be required to pass a medical examination.

Applications, giving details of age, qualifications, experience and present position, together with the names of two referees, should reach the undersigned not later than May 22, 1956.

C. B. MAWER,
Secretary.

2, Windsor Place,
Cardiff.

WALES GAS BOARD
PONTYPRIDD UNDERTAKING

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER AND MANAGER to the Pontypridd Undertaking, which receives unpurified gas from Coke Ovens and purified gas in bulk from the Board's Grid system.

To meet peak load demands, carburetted water gas is manufactured at the undertaking's works.

Applicants must have a sound knowledge and experience of modern distribution practice and of the management and administration of a gas undertaking. The applicant must hold the Institution of Gas Engineers Higher Grade Certificate in Gas Engineering (Supply) or its equivalent as a minimum qualification.

The commencing salary will be £950 per annum within Grade APT 12A (£900/£1,025 per annum), and the post is pensionable. The successful candidate will be required to pass a medical examination.

Applications, giving details of age, qualifications, experience and present position, together with the names of two referees, should reach the undersigned not later than May 22, 1956.

C. B. MAWER,
Secretary.

2, Windsor Place,
Cardiff.

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Both posts offer a wide and interesting field in the commissioning of contract plants installed by the Company and the operation of research pilot plants, and will involve travelling. Salary according to experience and qualifications; generous pension and insurance scheme. Applications should be made in writing, giving full details, to J. J. Priestley, W. C. Holmes & Co., Ltd., Research and Development Department, Whitechapel Road, Cleckheaton, Yorkshire.

SOUTH WESTERN GAS BOARD

BRISTOL/BATH DIVISION
APPOINTMENT OF TECHNICAL ASSISTANT

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at Canons' Marsh, Bristol. The appointment will be graded APT. 5, 6 or 7 (£575-£750) per annum, precise grade to be applied being dependent upon experience and qualifications.

The duties include Works supervision of all types, including Horizontal Retorts and Water Gas Plant.

Applications to be received by the undersigned, not later than May 26, 1956.

CHARLES R. INGHAM,
Production Engineer and Manager.

Radiant House,
Bristol, 1.
May 3, 1956.

AGENCY

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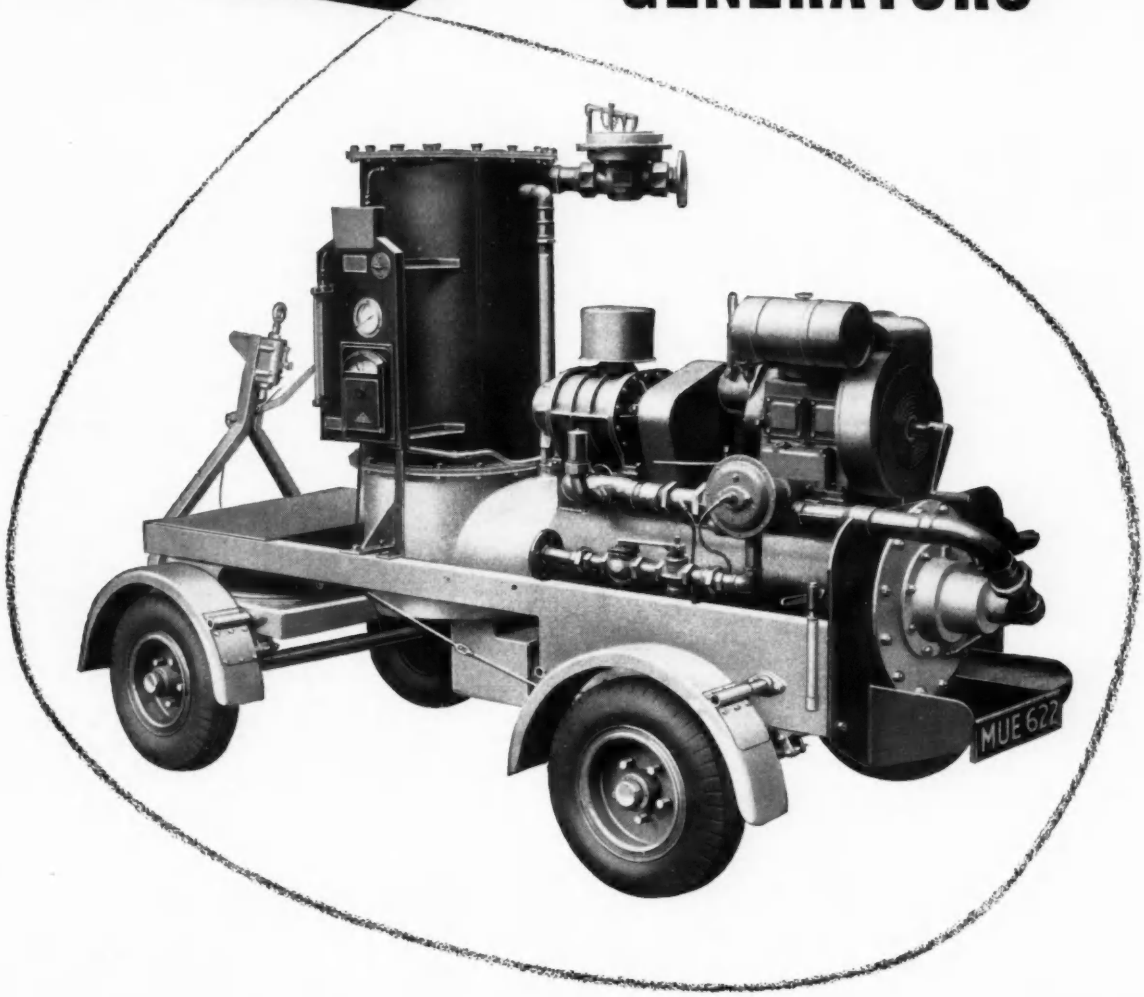

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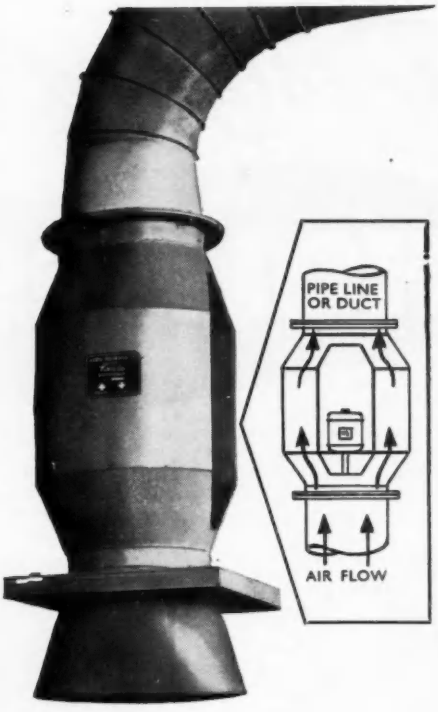

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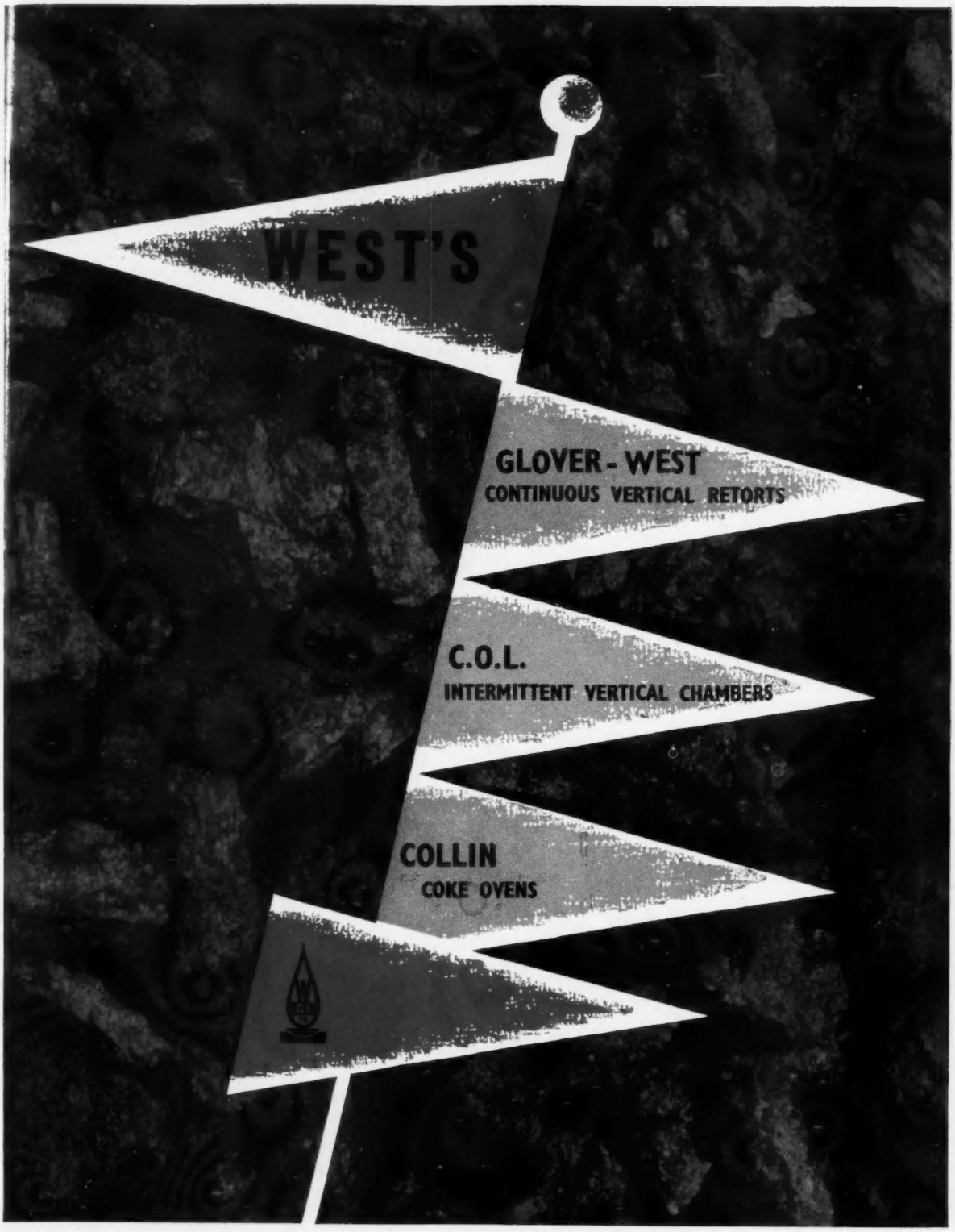

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